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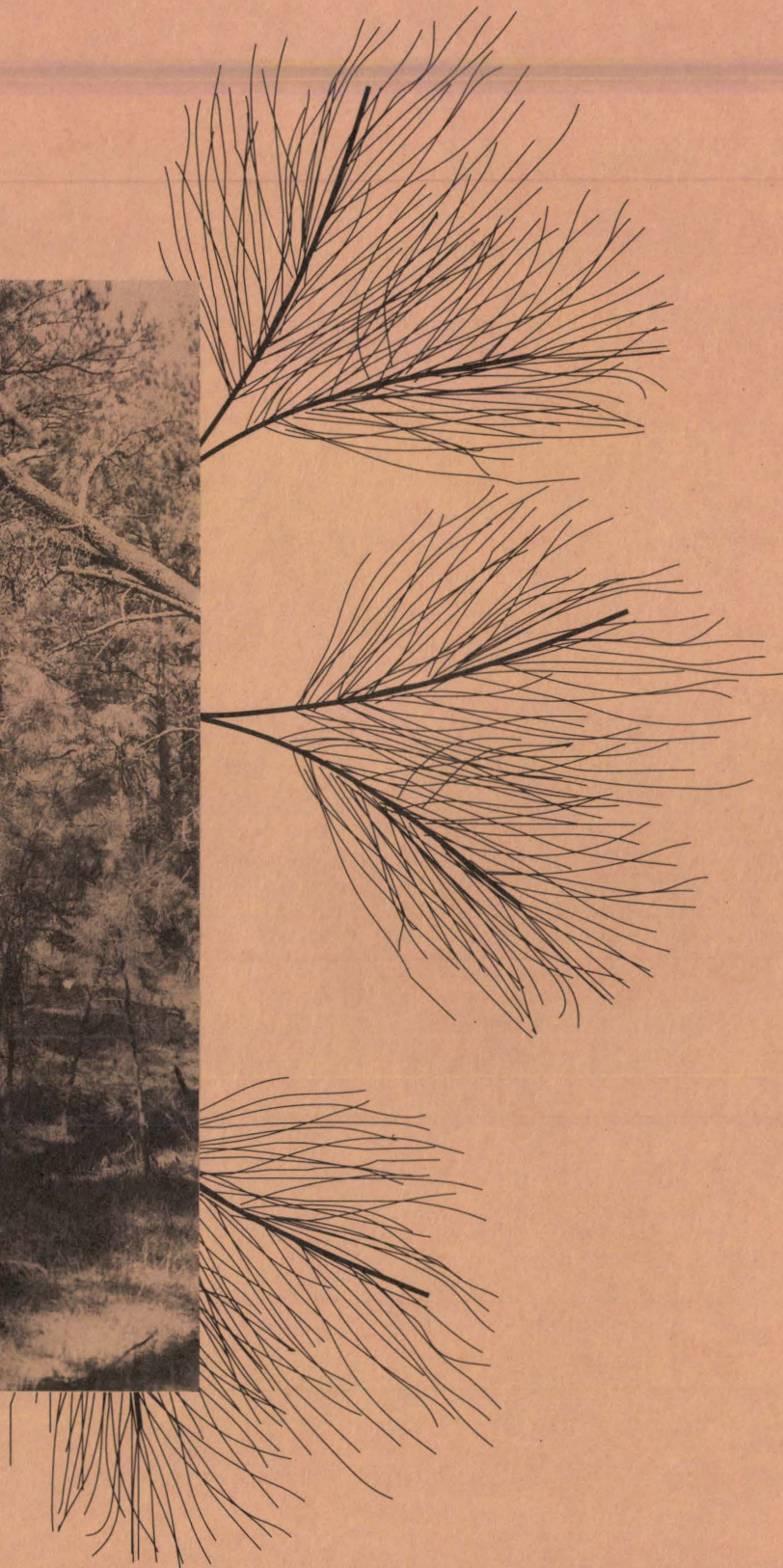
Research Paper
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The Forest Resources of Nebraska

Thomas L. Schmidt and Tom D. Wardle

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North Central Research Station
Forest Service—U.S. Department of Agriculture
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This report includes the most commonly used U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis (FIA) statistics. Additional forest resource data can be obtained through FIA staff, an FIA CD-ROM disc, or a table generator on the North Central Research Station's Internet page. Persons requesting additional information from FIA staff are expected to pay the retrieval costs. Requests may be directed to:

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FOREWORD

FIA is a continuing endeavor as mandated by the Renewable Resources Research Act of 1978. The objective of FIA is to periodically inventory the Nation's forest land. Up-to-date resource information is essential to frame forest policies and programs. USDA Forest Service regional experiment stations are responsible for conducting these inventories. Fieldwork for the third forest inventory of Nebraska was begun in August of 1994 and completed in November of 1994. Reports of previous inventories of Nebraska are dated 1955 and 1983. In addition, the Nebraska State Forest Service completed an inventory of the State's forest resources in 1977.

Data from new inventories are often compared with data from earlier inventories to determine trends in forest resources. However, for the comparisons to be valid, the procedures used in the two inventories must be similar. As a result of our ongoing efforts to improve the efficiency and reliability of the inventory, several changes in procedures and definitions have occurred since the last Nebraska inventory in 1983. Because some of these changes will make it inappropriate to directly compare the 1994 data with those published for 1983, data from the 1983 inventory have been reprocessed using the 1994 procedures. Please refer to the section labeled "Comparing the Third Inventory of Nebraska With the Second Inventory" in the Appendix for more details.

Perhaps the most significant change was the development of new volume tables between the 1983 and 1994 inventories of Nebraska's forest resources. The new volume tables, developed by USDA Forest Service research scientists and other cooperating researchers, more accurately estimate the true growing-stock and sawtimber volume. In general, the old volume tables used in the previous inventories underestimated the true volume. As a part of the current inventory, we updated the 1983 inventory using the new volume tables. As a result, the volumes that were recalculated for the 1983 inventory show an increase from the previously published volumes (Resource Bulletin NC-91 - *Nebraska Forest Statistics, 1983*, and Resource Bulletin NC-96 - *Nebraska's Second Forest Inventory*). All tables with 1983 data, and comparisons to the 1983 inventory results, in this publication reflect the recalculated volumes.

General topics for discussion concerning the forest resources of Nebraska are extent, ownership, composition, and causes of change estimates. For extent, ownership, and composition, current estimates are based on 1994 and changes over time are based on the period 1983 through 1994. Current year estimates of causes of change are based on 1982 and 1993, while averages over time are based on 1983 through 1994.

Although this report contains results of the 1994 FIA inventory effort for all classifications of land with trees, timberlands were the focus of the inventory and thus are the focus of this report. Timberland is considered forest land that has the capability to produce at least 20 cubic feet of wood fiber per acre per year. Because the 1994 inventory of Nebraska's forests is sample based, the reader is cautioned to consult the table of sampling errors when using any data contained in this report. For a detailed explanation of the sampling procedures, please see the Appendix.

FIA staff located in St. Paul, Minnesota, involved in the third inventory of Nebraska included Beth Collins, Barb Fuller, Dale Gormanson, Dan Groen, Ron Hackett, Mark Hansen, David Haugen, Neal Kingsley, Barb Knight, Leo Larkin, Earl Leatherberry, Troy Lindgren, Dennis May, Doug Magee, Pat Miles, Jerry Ostrom, Ron Piva, Gerhard Raile, Mary Jo Resendez, Thomas Schmidt, Jay Solomakos, and Dan Wendt.

FIA field staff located across Nebraska involved in this inventory were Todd Anderson, Kurt Buckler, Mark Gossman, William Groth, Dean Halvorson, Cheri Hartless, Patrick Hartless, Glenda Hefty, Ronald King, Christina Krie, Joel Lemberg, Kristen (Bailey) Lombard, Kyle Lombard, Jeffery Morse, Kendall Nyquist, Lawrence Plucinski, Trevor Sommers, Eric Stanton, Richard Steensma, Andrew Tuttle, James Veiman, Brad Witkin, and Erin Witkin.

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The Forest Resources of Nebraska

Thomas L. Schmidt and Tom D. Wardle

HIGHLIGHTS

- ❑ In 1994, Nebraska had 948 thousand acres of forest land, representing 2 percent of the State's total land area. Since 1983, the area of forest land has increased by 30 percent. Of this total area of forest land, 898 thousand acres were classified as timberland.
- ❑ In addition to the area of forest land, Nebraska had an additional 1.25 million acres of land with trees present in 1994.
- ❑ The Natural Resources Districts with the most area of forest land in Nebraska in 1994 were the Upper Niobrara-White with 174 thousand acres and the Papio-Missouri River with 105 thousand acres.
- ❑ Forests in Nebraska represent a unique convergence of vegetative communities. Central hardwood forests, Rocky Mountain forests, and northern boreal forests all converge in Nebraska. Other vegetation types that intermix with Nebraska's forests include the tall-grass, mid-grass, and short-grass vegetative communities. This diversity of vegetative communities is rarely encountered anywhere else in the world.
- ❑ In 1994, there were three conifer-dominated forest types and seven deciduous forest types classified in Nebraska. Elm-ash-locust was the most extensive forest type with 203 thousand acres, approximately one-fourth of the total timberland area.
- ❑ Between 1983 and 1994, the area of timberland with eastern redcedar as a dominant species increased by 61 percent, rising from 68 thousand acres to 110 thousand acres. While this was an important increase, the 42 thousand additional acres of eastern redcedar represented only 0.08 percent of the total area of Nebraska.
- ❑ In 1994, only 12 percent of the timberland in Nebraska was fully stocked. The State has an excellent opportunity to improve the growth rate in its timberlands through improved stocking and management.
- ❑ There were more than 300 million live trees on Nebraska's timberlands in 1994. With a statewide population estimated at 1.6 million in 1994, there were approximately 190 timberland trees for each Nebraskan.
- ❑ Growing-stock volume in Nebraska increased by 45 percent between inventories, rising to 854 million cubic feet in 1994. This increase was due to growth on existing timberlands and increases in area of timberland.
- ❑ In addition to the growing-stock volume, Nebraska had 476 million cubic feet in short-log, rough, rotten, and salvable dead trees in 1994. This volume represents an important source of wood fiber that supplements the growing-stock volumes in the State.
- ❑ The quality of the sawtimber volume in Nebraska was excellent. Overall, more than 50 percent of the State's sawtimber was in the two top quality grades. This ranks Nebraska as one of the top States in the Central United States in terms of sawtimber quality.
- ❑ In 1994, potential annual net growth on timberlands in Nebraska was estimated to be 48 million cubic feet. This potential growth rate is more than 300 percent

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higher than the actual average annual net growth measured over the last inventory cycle. While net growth rates are currently below expectations, Nebraska's timberlands have the potential to greatly increase their net growth. The advantage of increasing net growth is that it does not take additional acres of timberland to increase the future availability of wood fiber.

Nebraska is an important agricultural State with excellent croplands and prairies. However, it is also a State with a growing forest resource that is diverse, healthy, productive, and expanding. Nebraska's forests make many important contributions to the "Good Life" by providing a wide array of benefits (fig. 1). Almost all Nebraskans experience these benefits daily whether they live on a ranch in the sandhills or in Omaha. A child on a ranch may play in a windbreak, experience the thrill of seeing a brown thrasher (*Toxostoma rufum*), and have a warmer house in the winter because of trees. A child in Omaha may also climb a tree, experience one of the most pleasing of all outdoor sounds—hearing the whistle-like "cheer-cheer-cheer" of the northern cardinal (*Cardinalis cardinalis*)—and have a cooler house in the summer because of trees.



Figure 1.—Trees make important contributions to the quality of life in Nebraska.

Nebraskans have a long history of valuing their trees and forests. Some examples include being known as the Tree Planters' State, being the home of Arbor Day and the location of the National Arbor Day Foundation, having the largest planted national forest in the Nation (Nebraska National Forest-Bessey Division),

and having a nationally acclaimed Community Forestry Program. All of these point to the fact that trees and forests are vitally important to Nebraska residents.

For a long time after initial European settlement, the area of forest land in Nebraska declined. However, just as a native prairie recovers from a burn with vigorous growth, Nebraska's forests are also recovering from the historical decline with an impressive increase in the extent and composition of forest land. The area of forest land in Nebraska increased by more than 30 percent in the 11 years between inventories (rising from 718 thousand acres in 1983 to 948 thousand acres in 1994).

This recent increase in the area of forest land should cause excitement and make Nebraskans proud. Between the first and second inventory of Nebraska's forests (1955 and 1983), the area of forest land decreased by 20 percent (185 thousand acres). Thus, this recent increase is greeted with a resounding sigh of relief.

Unfortunately, many of the new forests occur on less productive types of land. The forest land cleared from the 1950's through today for agricultural purposes, urban and community expansion, and other reasons tended to be highly productive. This high productivity was one of the pre-eminent reasons for clearing the trees; the landowners felt that the lands were better suited for other uses such as croplands and pastures. Forest types that were lost included cottonwood (*Populus deltoides*), oak-hickory (*Quercus* spp. - *Carya* spp.), and maple-basswood (*Acer* spp. - *Tilia americana*). These forest types are the most productive in terms of potential growth and generally contain the highest valued species such as black walnut (*Juglans nigra*) and northern red oak (*Quercus rubra*).

The recent gains in area of forest land have come primarily in the elm-ash-locust (*Ulmus* spp. - *Fraxinus* spp. - *Gleditsia* spp.) forest type. While this forest type provides many ecological and economic benefits, its potential productivity and high-value species composition are lower than those forest types that were previously lost. Thus, although the recent gains in area of forest land are excellent news, there remains the challenge, where appropriate, of replacing the high-value forests that were cleared.

Not all of the land that was previously forested could, or should, be reforested. However, significant acreages of cleared land are subjected to factors that limit their potential for agricultural production. For example, croplands that frequently flood might be more productive, in both an economic and an environmental sense, if reforested. Croplands that are small and irregularly shaped, and thus inefficient for modern farming methods, might be more productive if reforested. Although the State has recently gained in area of forest land, Nebraska continues to face a forestry challenge.

HISTORICAL OVERVIEW OF NEBRASKA'S FORESTS

Presettlement Conditions

Pollen records indicate that as the ice sheet retreated during the Pleistocene period (approximately 10 thousand years ago), Nebraska was covered by boreal white spruce (*Picea glauca*) (Wright 1970). Evidence of this is found even in the Sandhills, where pieces of wood buried under the sand are sometimes encountered when water wells are drilled. Relics of this boreal forest include the stands of paper birch (*Betula papyrifera*) and quaking aspen (*Populus tremuloides*) that occur today across northern Nebraska. These boreal species are located in areas where they are protected from wildfires and are generally on north-facing slopes where the cooler, moister microenvironment is more conducive to their survival.

After the passing of the glacial period, it is believed that the forests of the Rocky Mountains reached across Nebraska and may possibly have connected with the eastern forests (Bessey and Webber 1889). Evidence of this is found in the deep canyons in Custer, Loup, and Garfield Counties where ponderosa pine (*Pinus ponderosa*) occurs. These locations are more than a hundred miles from the Pine Ridge region, which currently is the closest seed source of ponderosa pine.

Although Nebraska in ancient times was totally forested, recent history indicates a different scenario. Native Americans played an important role in the extent and composition of Nebraska's forest before European settlement. When early expeditions first entered Nebraska, their records indicate scarcely any

trees except along the rivers and streams. The exception to this was the Pine Ridge where ponderosa pine was found along the escarpments.

The line of demarcation between the forests and prairies found by the early settlers was due more to anthropogenic factors than to natural climatic factors. Early accounts indicate that Native Americans extensively used fire to attract game and to protect themselves from attack by other tribes. As a result, the edge of the forests was pushed eastward by the prairies, which were more accustomed to frequent burning. Trees were able to primarily maintain themselves only along rivers and streams due to the natural firebreak provided by the water.

The major portion of forested land before European settlement was in eastern Nebraska. From east to west, the tree resource became very scattered and changed from being predominately a mix of hardwood species to being composed of only cottonwood, bur oak (*Quercus macrocarpa*), green ash (*Fraxinus pennsylvanica*), and eastern redcedar (*Juniperus virginiana*). Progressing further westward, the native tree resource grew almost nonexistent until the ponderosa pine was reached near the Pine Ridge.

Settlement/Post-Settlement Conditions

Since initial European settlement, Nebraska has had a history of being involved in forestry. Settlers brought tree seeds and seedlings; one of the first activities of homesteading was planting trees. It is not unusual even today to enter a farmyard or ranch homestead and see species that are not typical of the native vegetation of the region (fig. 2).

Government programs designed to encourage settlement of the Great Plains often had a forestry component. For example, the Timber Culture Act of 1873 offered free land if the settlers planted trees as a part of their homestead (Schmidt and Wardle 1986). Tree planting was a popular activity across Nebraska due to the governmental incentive programs and the dedication of early settlers. One of the more famous early advocates of tree planting in Nebraska was J. Sterling Morton, who organized the first Arbor Day on April 10, 1872. Trees alive today at Arbor Lodge State Historical Park in Nebraska City were planted



Figure 2.—This American chestnut (*Castanea dentata*) in Cass County may have survived chestnut blight because it is far removed from the native range of the species.

by Mr. Morton and his wife. Other tree plantings with historical significance in Nebraska include the Sandoz apple (*Malus* spp.) orchards in Sheridan County and the Bruner plantings in Holt County.

The Dust Bowl days of the 1930's were also instrumental in the history of forestry in Nebraska. Dust storms, also called "black blizzards" cast a spell of doom over the entire Nation, but the primary impacts were felt in the Great Plains. Valuable topsoil was lost, crops were destroyed, livestock were killed, farm buildings were covered with drifts of soil, and dust filtered into homes, making life on the Plains very difficult (Croker 1991). As a result, President Franklin Roosevelt's Prairie States Forestry Project was instituted. This program envisioned a system of shelterbelts stretching from Texas to the Canadian border. Although the entire system was never completed, many of these early shelterbelts are still working today across Nebraska (fig. 3).



Figure 3.—This shelterbelt in Antelope County was the first shelterbelt established in Nebraska as a part of the Prairie States Forestry Project. It is located on the Schleusener farm near Orchard, Nebraska. A historical marker on the site commemorates early tree planting efforts in Nebraska.

This tree planting legacy is still evident in Nebraska. Each spring, crews plant seedlings for windbreaks, wildlife habitat, and livestock protection. Since its inception in 1926, the tree planting program of the Nebraska Forest Service has distributed more than 100 million seedling trees and shrubs. One of the great advantages of Nebraska, in terms of tree planting, is the system of Natural Resources Districts (NRD's) (fig. 4). This unique system of conservation leadership provides most tree planting services, and it is largely responsible for the State's tree planting success.

Extent of the Forest Resource in Nebraska

Nebraska's forest land totaled 948 thousand acres in 1994, representing 2 percent of the State's total land area. The forest land consisted of 898 thousand acres of timberland, 32 thousand acres of reserved timberland, and 18

Nebraska's Natural Resource Districts/Counties

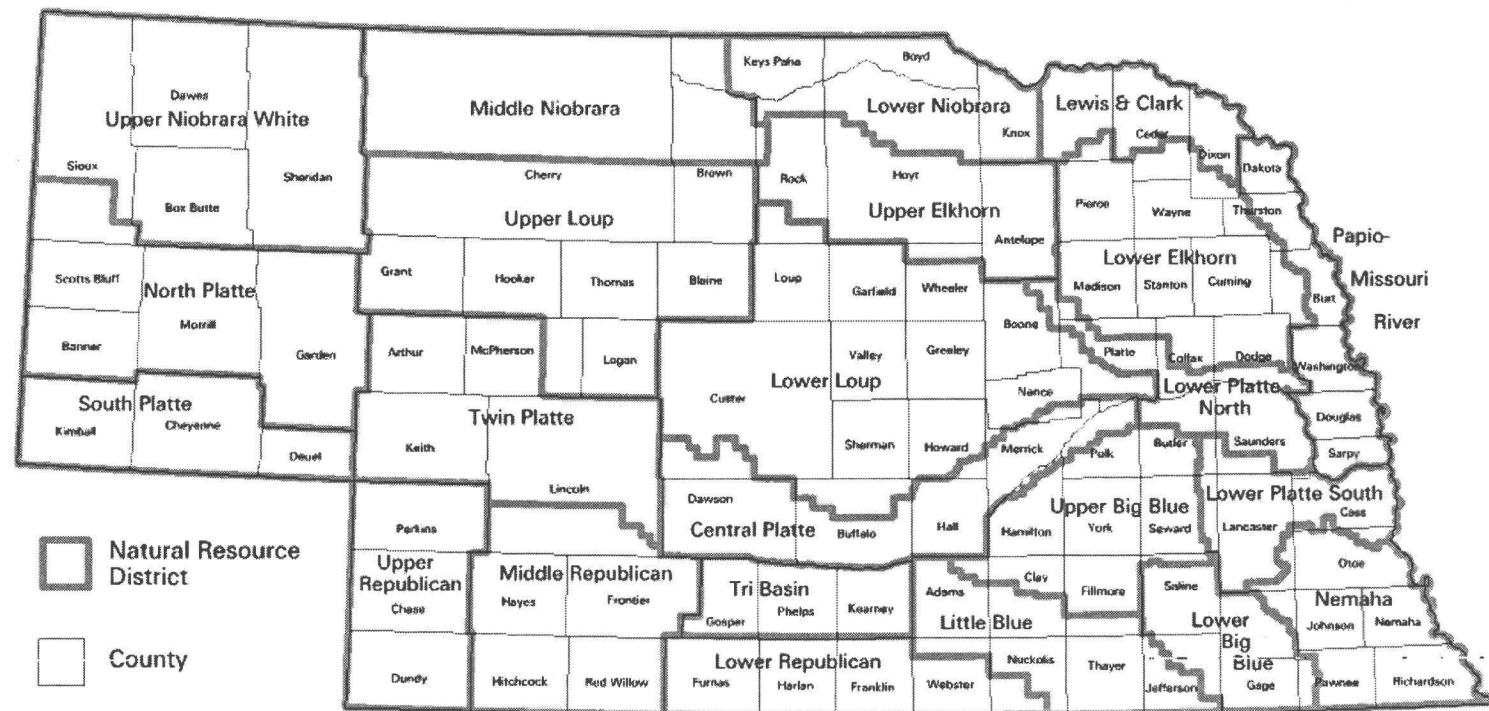


Figure 4.—Nebraska's Natural Resource Districts.

thousand acres of other forest land (land classified as forest land but not sufficiently productive to be classified as timberland). In addition to the area of forest land, an additional 1.25 million acres had some trees present but not enough to be classified as forest land. In 1994, these other lands with trees included about 5 thousand acres of Christmas tree plantations and 179 thousand acres of narrow wooded strips.

While 2 percent of the total land area statewide was forested, six NRD's had more than double this average with at least 4 percent of their total land area forested. The most heavily forested NRD in 1994 was the Papio-Missouri River NRD with 9.4 percent of its total land area forested. Other NRD's with above average levels of forest land include the Lewis and Clark, Nemaha, Lower Platte South, Upper Niobrara-White, and Lower Niobrara. From the perspective of percent forested, the North, South, Twin Platte/Upper Loup NRD group was the least forested. In this NRD group, forest land accounted for 0.5 percent of the total land area.

Area of Forest Land Increases

The area of forest land in Nebraska has historically declined since the early 1900's. However, the recent inventory shows a dramatic reversal of this trend. Between 1983 and 1994, the area of forest land increased by

32 percent, rising from 718 to 948 thousand acres (fig. 5). Factors that influenced this increase in area of forest land include a decrease in the number of farm operations, changes in livestock grazing management schemes, the lack of annual soil disturbance on former croplands (Crockett 1985), and wildfire control (Owensby *et al.* 1973).

Timberland Plantations

More than 98 percent of the timberland in Nebraska occurs naturally. Although planting trees has been an important activity since European settlement, it has not significantly impacted the extent of the State's timber resource. Plantations accounted for slightly more than 14 thousand acres of timberland in 1994. However, while the area of timberland plantations is considered relatively small, the overall area of land planted to trees in Nebraska is much larger. The vast majority of land planted to trees is classified as "other land with trees" rather than as forest land, primarily due to the plantings not meeting the minimum requirements to qualify as forest land (more than 120 feet in width and at least one acre in total area).

Most timberland plantations in Nebraska are multiple-purpose plantings for wildlife habitat, soil erosion protection, and water quality protection, along with timber production; black walnut plantations designed to produce



Figure 5.—This land with newly established trees is now classified as forest land, contributing to the increase in the area of forest land between inventories.

high-quality logs; and/or wide windbreaks that have timber production as a secondary purpose. While some of the plantations might be single purpose, they still provide other benefits. In a State such as Nebraska where the overall tree resource is limited, many benefits are associated with the existence of trees beyond simply the acres actually planted to trees.

Although plantations generally provide increased environmental benefits, a word of caution should be expressed about tree plantings and virgin prairies. Nebraska is a prairie State. The area of some types of prairie, such as tall-grass prairies in eastern Nebraska, has been severely diminished in Nebraska as well as throughout the Great Plains. Trees either planted directly into, or adjacent to, these rare prairies can allow both woody vegetation and forest-dependent wildlife species to encroach on the prairie remnants, thus altering their environmental role.

Reserved Forest Lands

The area of reserved forest land in Nebraska increased from about 5 thousand acres in 1983 to 32 thousand acres in 1994. The majority of this increase occurred due to the establishment of the Soldier Creek Wilderness Area on the Nebraska National Forest as well as the expansion of the park system across the State. New parks that have been established by the State, NRD's, and local governments all have contributed not only to the expansion of the area of reserved forest land but also to the increase in recreational opportunities available. Examples of new parks since 1983 include the Eugene T. Mahoney State Park and the Wierspahn Lake Park operated by the Papio-Missouri River NRD.

Other Lands With Trees Make Important Contributions

In 1994, there were 179 thousand acres of narrow wooded strips in Nebraska. These lands were not included in the totals for forest land because they were less than 120 feet in width. These acreages included native vegetation found along many water corridors and modern windbreaks that often consist of only a few rows of trees and shrubs. These narrow wooded strips provide wildlife habitat and travel corridors, provide wind erosion protection when located adjacent to croplands, and

improve water quality when located along rivers and streams.

In addition, there were 1.1 million acres of nonforest land with trees in Nebraska in 1994. These acreages consisted of pastures and rangelands, croplands, and wetlands with an insufficient number of trees to be classified as forest land. Typically, these lands contain scattered trees that are secondary to the primary land use. Despite their scattered nature, these trees make important contributions to the biodiversity, scenery, and wildlife habitat associated with these other land uses.

Regional Differences in Nebraska's Forest Resource

Forests in Nebraska represent a unique mix of several different vegetation types. Central hardwood forests representative of the Eastern United States, ponderosa pine forests representative of the Rocky Mountains, and paper birch forests representative of the northern boreal forests all converge in Nebraska. This convergence occurs along the Niobrara River where black walnut grows intermixed with ponderosa pine and paper birch. Other vegetation types that mix in this region include the tall-grass, mid-grass, and short-grass prairie communities.

From east to west, the forest resource of Nebraska can be viewed in three geographical sections. The forests in the eastern third of the State are composed predominately of deciduous species and occur across the landscape in nearly all soil types, landforms, and physiographic classes. The forest resource in the central part of the State is most commonly associated with water corridors and, except for eastern redcedar, occurs predominantly on lowland sites. In the western third of Nebraska, outside of the Pine Ridge, little forest land is found. The majority of the forests in this region are the ponderosa pine forests associated with the escarpments of the Pine Ridge. Other lands with trees in the western third of the State have scattered deciduous species along the water corridors.

As one moves west across the State, climate plays an ever-increasing role in determining the extent and type of forest resource. Eventually, one reaches the vast western plains where life for a tree can be especially precarious. In addition to influencing the overall extent of the

forest resource, the mid-continental climate found in Nebraska has a dramatic influence on species richness. There are more than five times as many native woody species found in eastern Nebraska than in western Nebraska.

On a regional basis, both eastern and western Nebraska increased in area of forest land between inventories. Concerning area of forest land, eastern Nebraska increased by more than 50 percent and western Nebraska increased by 24 percent in the 11 years (fig. 6).

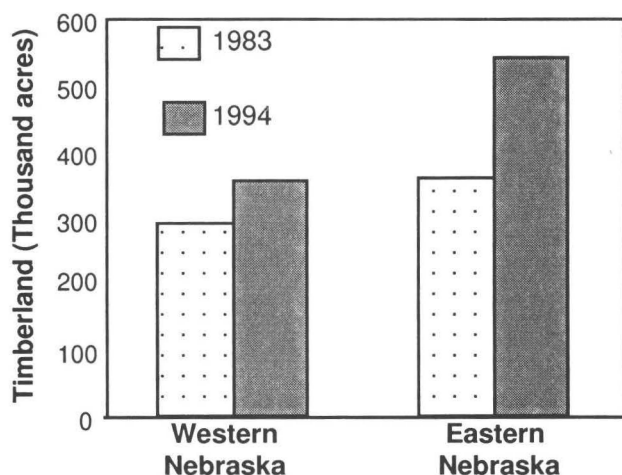


Figure 6.—Area of timberland in western and eastern Nebraska in 1983 and 1994.

Ownership of the Timberland Resource in Nebraska

Almost nine out of every ten acres of timberland in the State are privately owned (fig. 7). This high level of private ownership is not surprising because approximately 97 percent of all land in Nebraska is privately owned. Private landowners accounted for more than 750 thousand acres, corporations owned 21 thousand acres, and Native Americans owned about 17 thousand acres of timberland in Nebraska in 1994. National forests (47 thousand acres) and the State (50 thousand acres) accounted for most of the public ownership of timberlands in Nebraska in 1994.

COMPOSITION OF NEBRASKA'S FORESTS

Nebraska's forests are comprised of a wide variety of trees, shrubs, and understory vegetation. All the trees found in Nebraska are grouped or classified into forest types that

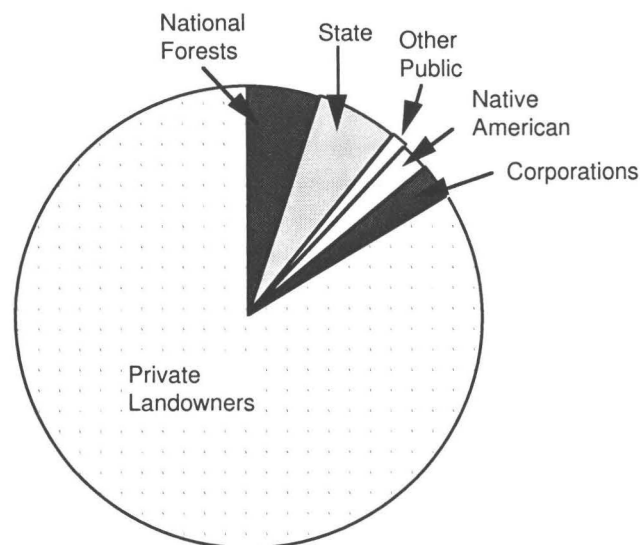


Figure 7.—Ownership of timberland in Nebraska in 1994.

reflect the combinations of species that occur. The distribution of trees is based on site characteristics, past history, and climate. Each of these factors influences what vegetation is currently found on the site and what vegetation is potentially able to exist there. As an example, the forest type elm-ash-cottonwood (*Ulmus* spp. - *Fraxinus* spp. - *Populus deltoides*) primarily grows on bottomland sites. However, past flooding, drainage efforts, fires, and/or harvesting have influenced what species currently exist on such soils. One bottomland site might be typed as elm-ash-cottonwood and another might be typed as just cottonwood. Both sites might have the potential to be either forest type, but due to previous influences they evolved into different forest types. Forest types in Nebraska range from early-successional forest types such as eastern redcedar and/or cottonwood to mid- to late-successional forest types such as maple-basswood.

Forest Types in Nebraska

Between 1983 and 1994, the area classified as cottonwood, willow (*Salix nigra*), and oak-hickory forest types decreased (fig. 8). The declining area of the cottonwood and willow forest types reflects a maturing of Nebraska's forest resources and changing land management practices such as increased efforts at flood prevention. Both of these forest types are considered early successional. Most of the

decrease in area of these two forest types was due to the forest land being reclassified as another forest type rather than being classified as another land use. On bottomland sites, both cottonwood and willow are replaced by other hardwood species such as hackberry (*Celtis occidentalis*), green ash, sycamore (*Platanus occidentalis*), and other shade-tolerant species if there are no disturbances and succession is allowed to take place.

Nebraska's forest composition has shifted over time. Table A shows the FIA-determined land classification changes from 1983 to 1994. The decline in area of oak-hickory reflects a reclassification into the bur oak, maple-basswood, and elm-ash-locust forest types. On the surface, it might appear that Nebraska "lost" 12.8 thousand acres of oak-hickory timberland (50.5 thousand acres in 1983 compared to 37.7 thousand acres in 1994). However, those forested acres remained forested: what happened was the species composition changed between inventories and the forest land was reclassified from one forest type to another.

All the other forest types in Nebraska increased in area between inventories. As mentioned, some of the increase in these forest types was due to succession and does not represent new areas of timberland. The largest increase in area of timberland occurred in the elm-ash-locust forest type, which almost doubled in area between inventories.

Elm-Ash-Locust was the Most Extensive Forest Type

In 1994, elm-ash-locust was the most extensive forest type in Nebraska with 203 thousand acres. The large increase between inventories in the area of elm-ash-locust forests enabled it to become the most common forest type in Nebraska. In 1994, almost one-fourth of the total area of timberland in the State was in the elm-ash-locust forest type. More than 80 percent of the area of elm-ash-locust was in eastern Nebraska.

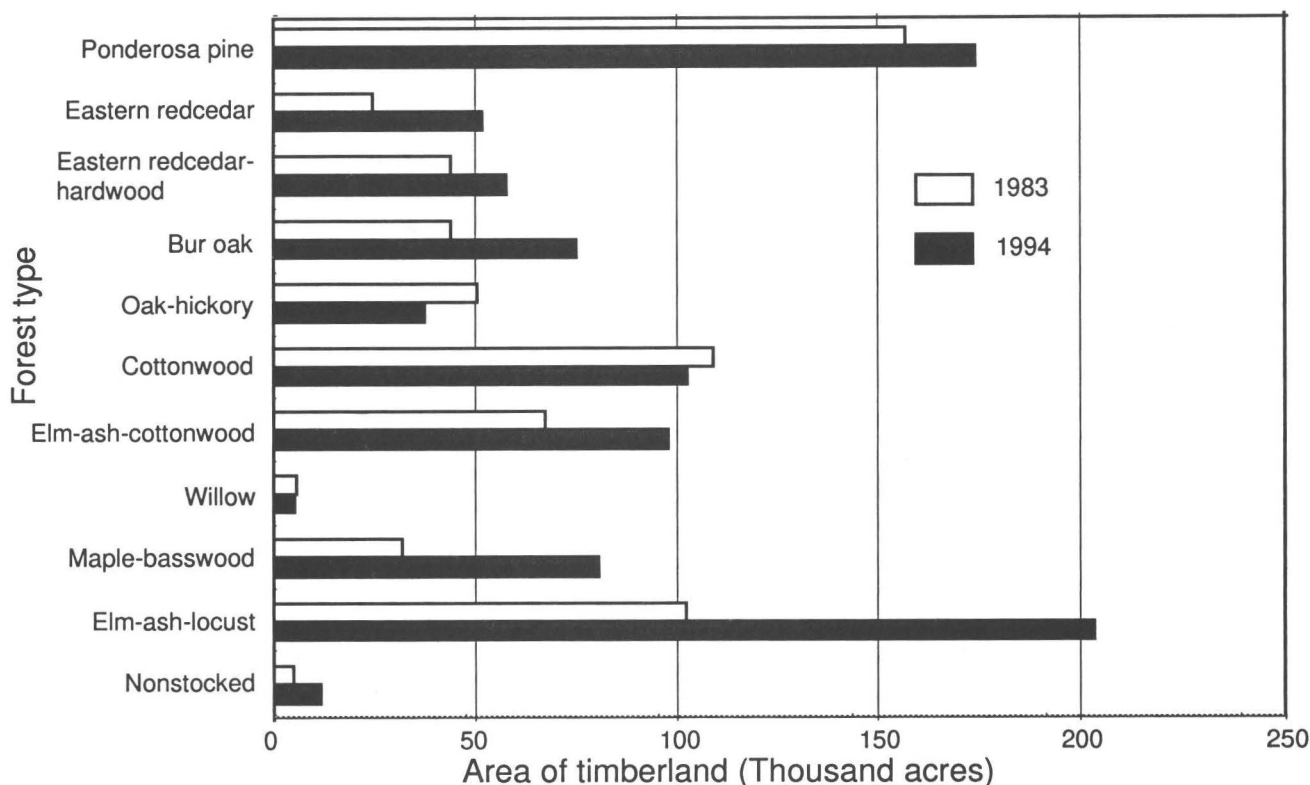


Figure 8.—Area of timberland by forest type in Nebraska in 1983 and 1994.

Table A.--Land-use classification changes in Nebraska, 1983-1994

Forest type	1983 total area ²	1994 Land Classification ¹																	
		Timberland - Forest Type											Other forest land	Reserved timberland	Wooded strips	Other nonforest with trees	Nonforest without trees	Non- census water	Census water
		Ponderosa	Eastern	Eastern		Cotton-		Oak-	Elm-ash-	Maple-	Elm-ash-	Non-							
		pine	redcedar	redcedar-	Bur oak	wood	Willow	hickory	wood	basswood	locust	stocked							
(Thousand acres)																			
Ponderosa pine	156.8	118.5	-	-	-	-	-	1.1	-	-	-	10.5	-	24.0	-	2.7	-	-	-
Eastern redcedar	24.4	-	15.1	9.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eastern redcedar-hardwood	43.9	-	9.1	30.4	2.9	-	-	-	-	-	-	-	-	-	-	1.4	0.1	-	-
Bur oak	44.2	-	-	-	40.0	-	-	4.2	-	-	-	-	-	-	-	-	-	-	-
Cottonwood	109.2	-	-	-	-	87.0	-	-	18.2	-	-	1.0	-	-	-	3.0	-	-	-
Willow	5.8	-	-	-	-	-	5.0	-	-	-	-	-	-	-	0.8	-	-	-	-
Oak-hickory	50.5	-	-	-	11.3	-	-	22.6	-	12.4	4.2	-	-	-	-	-	-	-	-
Elm-ash-cottonwood	67.4	-	3.8	4.2	-	-	-	-	32.3	4.6	12.4	-	-	-	-	6.5	3.6	-	-
Maple-basswood	32.1	-	-	-	-	-	-	-	1.8	23.6	1.2	-	-	-	-	3.1	2.4	-	-
Elm-ash-locust	102.4	-	-	5.3	-	-	-	-	23.9	8.5	61.1	-	-	-	0.4	3.2	-	-	-
Nonstocked	4.8	-	2.1	-	-	-	-	-	-	-	-	-	-	-	-	-	2.7	-	-
Unproductive forest	71.5	18.7	5.2	-	-	4.6	-	-	6.4	-	-	-	12.5	-	-	24.1	-	-	-
Productive reserved	5.3	-	-	-	-	-	-	-	-	-	-	-	-	5.3	-	-	-	-	-
Wooded strips	262.2	1.1	1.2	2.2	0.8	0.7	-	-	6.0	-	8.7	-	-	-	120.8	93.6	27.1	-	-
Other nonforest with trees	849.5	35.7	15.5	6.5	20.3	10.4	-	9.8	8.7	31.8	104.5	-	5.1	2.4	52.1	397.0	143.4	6.3	-
Nonforest without trees	47,175.4	-	-	-	-	-	-	-	0.8	-	11.2	-	-	-	5.3	534.7	46,426.3	122.2	74.9
Noncensus water	46.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46.8	-
Census water	455.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	222.3	-	232.8
Total	49,507.3	174.0	52.0	57.9	75.3	102.7	5.0	37.7	98.1	80.9	203.3	11.5	17.6	31.7	179.4	1,069.3	46,825.1	175.3	307.7

¹Read across rows to determine dispersion of 1983 classes to 1994 classes. Read down columns to determine origin of 1994 classes.

²Total land area adjusted to conform to 1980 census figures.

To use Table A - for example to find out what happened to the 154 thousand acres of ponderosa pine present in 1983 - simply read across the ponderosa pine row and find that about 119 thousand acres stayed as ponderosa pine, 11 thousand acres were reclassified as nonstocked, 21 thousand acres were reclassified as reserved timberland, and so on.

To determine the source of the 174 thousand acres of ponderosa pine present in 1994, read down the ponderosa pine column. Of these acres, 119 were classified as ponderosa pine in both inventories, 19 thousand acres were reclassified from unproductive forest to ponderosa pine timberland, and so on.

The elm-ash-locust forest type is generally found on upland sites and is considered mid-successional in the Great Plains. The predominant tree species in this forest type are green ash, hackberry, honeylocust (*Gleditsia triacanthos*), American elm (*Ulmus americana*), and mulberry (*Morus* spp.). As the area of forest land in Nebraska continues to expand, a significant part of the expansion will probably occur in this forest type.

Cottonwood has Interesting History

Cottonwood historically has been the tree species most commonly associated with Nebraska. It is the State Tree, it served as a reference point for both Native Americans and early settlers, and it has been the primary species harvested in Nebraska. However, the standing that cottonwood has enjoyed for so many years in Nebraska is in jeopardy. Cottonwood requires a bare mineral soil to regenerate. It was prolific in the past due to the periodic flooding that occurred along the State's rivers and streams. Historically, flooding was a common occurrence along the Republican, Platte, Blue, Elkhorn, Missouri, and many other rivers and streams in Nebraska. Since the 1950's, numerous flood control structures have been built across the State. There are still occasional floods, but they are not as extensive as those of the past. While this has enabled many additional uses of these riparian bottomlands, it has reduced the ability of cottonwood to regenerate. The scouring effect of flooding that produced prime sites for cottonwood to establish is no longer a major factor and has led to a dramatic decrease in the area of younger cottonwood.

As a result of the flood control efforts, the average age and size of cottonwood are much different than for other species, such as eastern redcedar, that have different site requirements for establishment. We anticipate that cottonwood will continue to decrease in both area as well as in the number of trees. This decrease will have many impacts ranging from changing the composition of Nebraska's forests to changing the timber industry in the State as the supply of cottonwood logs decreases.

Other Hardwoods

Other hardwood forest types that increased between inventories were bur oak, elm-ash-cottonwood, and maple-basswood. The elm-ash-cottonwood forest type is generally considered a lowland/riparian forest type and is commonly found along water corridors. Elm-ash-cottonwood is a companion forest type with elm-ash-locust. Both forest types have common species, primarily elm, green ash, and hackberry. On the lowland sites, cottonwood and silver maple (*Acer saccharinum*) are common but are not typically found on upland sites.

The increase in the area of maple-basswood reflects the maturing of Nebraska's forests. In the future, the area of maple-basswood is expected to continue to increase. More than 90 percent of the area of elm-ash-cottonwood and maple-basswood in 1994 was in eastern Nebraska.

Eastern Redcedar

Eastern redcedar is a dominant species in Nebraska in two forest types, the eastern redcedar and the eastern redcedar-hardwood forest types. In the eastern redcedar forest type, eastern redcedar is typically found in almost pure stands. In the eastern redcedar-hardwood forest type, hardwoods represent most of the stocking, but eastern redcedar makes up between 25 and 50 percent of the total stocking. For the purposes of this discussion, both forest types are combined and considered as eastern redcedar forests.

Of all of the tree species in Nebraska, eastern redcedar probably has received the most attention in the past 10 years because of its capability of expanding into rangelands and pastures. As noted previously, changes in agricultural practices and policies and improved fire prevention efforts have enabled eastern redcedar to expand in both total area and number of trees.

The expansion of eastern redcedar has both positive and negative impacts. From a positive viewpoint, eastern redcedar provides wildlife habitat for species that rely on woody vegetation for their survival; additional sources of

income as eastern redcedar is actively harvested for posts, shavings, and logs; increased species richness in areas where woody vegetation is limited; soil erosion protection; improved water quality; protection for livestock in both summer and winter; and other positive environmental impacts. From a negative viewpoint, the expansion of eastern redcedar can make handling livestock more difficult, can reduce forage production, and can degrade native prairies.

Depending on one's outlook, the expansion of eastern redcedar is either a boom or a bust. Whether one views this as positive or negative, it is occurring and is an important topic in the natural resource field in Nebraska. However, the degree of expansion should be put into perspective. Between 1983 and 1994, the area of timberland with eastern redcedar as a dominant species increased by 61 percent, rising from 68 thousand acres to 110 thousand acres. Although this is an important increase, the 42 thousand additional acres of eastern redcedar represent only 0.08 percent of the total area of Nebraska.

It is projected that the area of eastern redcedar timberland will continue to increase. Control efforts are limited due to economic and resource realities. Prescribed fire is the most efficient method of control for smaller eastern redcedar trees (Wilson and Schmidt 1990). However, the number of acres that can be burned in any one year under controlled conditions is limited due to weather factors, availability of trained professionals, and land-use/terrain restrictions. In addition, mixed land ownerships and liability concerns about uncontrolled fires limit the area burned. Prescribed fire will not be an available solution on a large scale due to these factors. Other control methods include mechanical removal and chemical control. Mechanical removal is expensive and the cost of many eastern redcedar control efforts exceeds the value of the land. It does not make economic sense to spend more than the value of the land to control eastern redcedar. Chemical control can also be expensive and has associated environmental limitations and impacts.

As a result, the most realistic solution is to recognize that eastern redcedar is expanding and that uses of the resource need to be identified and developed. For example, eastern redcedar is dioecious (trees are either male or

female). In areas where the expansion of eastern redcedar is a concern, removal should be focused on the female plants. The male plants can be pruned and groomed as another source of income without negatively impacting forage production. Clear (knot- and defect-free) eastern redcedar logs are a viable product with a number of markets (fig. 9).

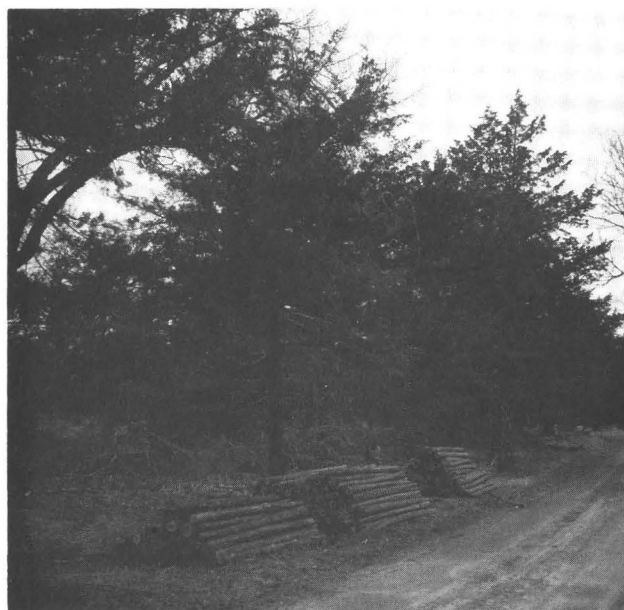


Figure 9.—*The market for eastern redcedar has been growing and is expected to continue to be strong in the future.*

Ponderosa Pine

Ponderosa pine is found in the Pine Ridge, eastward along the Niobrara and Snake Rivers, and in other scattered pockets in western Nebraska such as the Wildcat Hills south of Scottsbluff. The area of ponderosa pine in Nebraska increased from 157 to 174 thousand acres between 1983 and 1994. The Pine Ridge has dramatically changed over time with European settlement and ensuing wildfire control efforts. Early records indicate that in the Pine Ridge, ponderosa pine was scattered and primarily located on sites that were protected from fires. As fires were controlled in this region, ponderosa pine expanded across the landscape. This expansion is continuing today and is evidenced by the increase in timberland area of ponderosa pine. Along the Pine Ridge, the old "Bull Pines" from the 1800's are occasionally evident and, based on their bark and fire scars, would have a very interesting history to tell (fig. 10).



Figure 10.—These old ponderosa pine trees, often locally referred to as “Bull Pines,” provided the seed source for the expansion of ponderosa pine in the last 50 years.

Ponderosa pine is the one species in Nebraska that can be effectively managed for both forage and fiber production (hardwood forests are usually degraded if grazed by livestock). The Pine Ridge has a long history as ranching country with associated livestock use. Although livestock grazing has been the dominant land use, ponderosa pine has continued to thrive and expand.

Nonstocked Timberland

The area of nonstocked timberland in Nebraska increased from 5 to 12 thousand acres between 1983 and 1994. Nonstocked timberland is land that has forests as its primary land-use but didn't have a sufficient number of trees present during the inventory to be classified into a forest type. Forested stands that were harvested in the past year that have not had sufficient time to regenerate are an example of nonstocked timberlands. Western Nebraska had 10 of the 12 thousand acres of nonstocked timberlands. These nonstocked timberlands in western Nebraska were probably sites in the Pine Ridge where ponderosa pine had been recently harvested or burned. It is expected that these lands will regenerate in the next few years, to the point where they would be classified as timberlands in the next inventory.

Nebraska's Timberland is Productive

The productivity of Nebraska's timberland is evaluated based on potential wood productivity. Potential productivity is an estimate of the

cubic feet of growth per acre per year at culmination of mean annual increment of a fully stocked natural stand. Although this definition is a measure of industrial wood production, it is a good indicator of the potential for a forest to produce a wide array of products and benefits.

Potential productivity is related to the quality of a site and generally does not change over time, assuming that no significant site degradation occurs. In both inventories, 22 percent of the total area of timberland had a potential productivity of more than 85 cubic feet per acre per year. As a comparison, Minnesota also has about 22 percent of their timberlands with this level of potential productivity (Leatherberry *et al.* 1995). Missouri's latest inventory found that only 5 percent of their timberlands had this level of potential productivity (Spencer *et al.* 1992).

Eastern and central Nebraska have excellent soils in most locations where forests occur. The major limiting factor for trees in Nebraska is generally related to climatic and land-use restrictions rather than soil productivity. Where trees do occur, they have the potential to have good growth rates and resulting production of wood fiber. The level of potential productivity decreases as one moves west in the State.

Site index is another measure of productivity. It is an expression of forest site quality based on the average height of free-growing dominant or co-dominant trees at age 50. In general, across the Nation, good productivity is expected on sites with a site index of more than 50. Site index measures include not only those described for potential productivity but also climatic factors because they are important from a tree height-growth perspective. In Nebraska, due to climatic limitations including higher than average winds and lower than average humidity, trees often do not grow as tall as in other parts of the Nation. As a result, site index classification in Nebraska should be used with caution and should be considered conservative as an estimate of productivity.

In 1994, 64 percent of Nebraska's timberland was rated as having a site index of more than 50. Considering the above-mentioned climatic restrictions on tree height, it is excellent to have this high of a percentage in the higher

site index classes. Excellent productivity is expected on sites with a site index greater than 80. In 1994, 13 percent of all the timberland in Nebraska had a site index of more than 80. As a comparison, Michigan also had 13 percent of its total area of timberland rated in site index classes of more than 80 (Schmidt *et al.* 1997). Minnesota had 6 percent of its timberland in this excellent site index class (Leatherberry *et al.* 1995).

Regionally, eastern Nebraska has a higher percentage of sites in the better classes than western Nebraska. The lower expected production in western Nebraska is a reflection of the poorer growing conditions due to climatic and soil limitations.

Stocking of Nebraska's Timberlands Can Be Improved

Considering potential productivity and site index measures, Nebraska has productive timberlands that have the capability of producing a wide variety of forest-related products at an above average rate. To accomplish this, the timberlands should be well stocked. Stocking is a measure of how well-occupied the land is by trees (typically measured by basal area). Although there can be exceptions, full stocking generally provides the greatest level of both timber and nontimber benefits from a forest.

In 1994, only 12 percent of the timberland in Nebraska was fully stocked (106 thousand acres) and less than 1 percent was overstocked (3 thousand acres). With only 12 percent of the timberland in the State fully stocked, a number of opportunities exist. Improving the stocking level on understocked stands can increase the productivity of the forest resource without impacting other land-uses.

Size Class

Stand size reflects the average diameter of the dominant trees and is classified as being either small- (sapling/seedling), medium- (poletimber), or large- (sawtimber size) size stands. All three size classes increased in total area between inventories, primarily due to the overall increase in area of timberland.

The sapling/seedling stand size represents younger, recently established stands. The

area of timberland in Nebraska in this stand-size class increased by more than 39 thousand acres between 1983 and 1994 (fig. 11). In 1994, sapling/seedling-size stands accounted for 11 percent of the total area of timberland in Nebraska. This increase was due to stands regenerating after harvest and to lands previously classified as non-forest land being reclassified as timberland. These young stands should have high growth rates because younger trees tend to grow more vigorously than older trees. Although their growth rates are generally high, the net volume increment is not high due to their small average diameters. One inch of diameter growth on a 4-inch tree results in a much lower total increment in volume than 1 inch of diameter growth on an 18-inch tree.

Average stand-size class for eastern redcedar is interesting because 56 percent of the total area of the eastern redcedar forest type was in the small stand-size class in 1994. Statewide, only 11 percent of all timberlands in Nebraska were in this same average stand-size class. This high percentage in the small-size class reflects the newly established eastern redcedar forests.

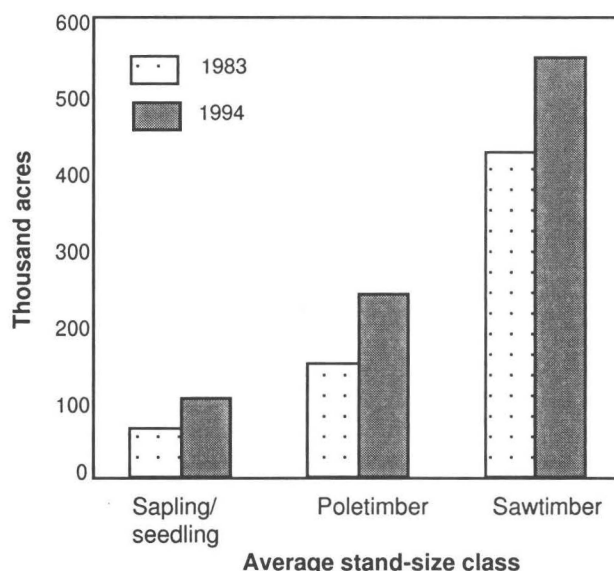


Figure 11.—Average stand-size class for timberlands in Nebraska in 1983 and 1994.

Comparatively, only 8 percent of the area of eastern redcedar-hardwood forest was in the small size class. The majority of the timberlands in this forest type were in the larger average stand-size classes, exhibiting the role

of hardwoods in this forest type. Eastern redcedar is able to grow not only in rangelands and pastures but also in existing stands of hardwood trees. It is able to photosynthesize in early spring and late fall when the deciduous trees do not have leaves and the understory eastern redcedar trees receive full sunlight. Good examples of this in Nebraska can be found along the Platte River throughout the central part of the State (fig. 12). In most of these stands, the dominant trees are hardwoods and eastern redcedar is primarily in the understory. As a result, the eastern redcedar-hardwood forest type is predominantly in the medium to large size classes. Over time, the eastern redcedar may become the dominant species as the overstory deciduous trees mature and die.



Figure 12.—*Eastern redcedar as a component of the understory of hardwoods. This stand is located adjacent to the Platte River just east of North Platte, Nebraska.*

Between inventories, the area of medium-size stands (poletimber) increased by 90 thousand acres, rising from 149 thousand acres in 1983 to 239 thousand acres in 1994. Some poletimber-size stands in 1983 grew into the larger size class and were reclassified as sawtimber in the most recent inventory. At the same time, stands classified in the 1983 inventory as sapling/seedling size grew to the point where they were reclassified as poletimber size. In addition, some of the new area of timberland was classified as poletimber. In

these stands, there were some trees present in the previous inventory but not to the extent to where the land was classified as forest land. Between inventories, additional trees became established and the existing trees grew. As a result, in the current inventory, the land was reclassified as forest land and the trees were of sufficient size to be classified as poletimber.

In both 1983 and 1994, more than 60 percent of all timberlands in the State were classified as being in larger, more mature stands (sawtimber-size stands). As Nebraska's forests continue to mature, the percentage of timberland in this larger size class is expected to increase.

Most forest types in Nebraska follow rather closely with the statewide averages in terms of percentages in the various size classes. However, the ponderosa pine, elm-ash-cottonwood, and cottonwood forest types had an above average percentage of their total area of timberland in the sawtimber-size class. More than 75 percent of the elm-ash-cottonwood, 82 percent of the ponderosa pine, and 89 percent of the cottonwood acreage were classified as sawtimber-size. The large average stand-size in the two cottonwood-dominated forest types was due to the lack of regeneration and to this species' rapid growth rate. Cottonwood trees on a good site, which is typical for cottonwood because it is a bottomland species, can attain sawtimber-size in 20 years or less.

The high percentage of ponderosa pine in the sawtimber-size class is related to European settlement and ensuing fire protection in the region (fig. 13). Wildfire protection has steadily improved over time with increased road access and with growth in protection programs such as the Rural Volunteer Fire Districts and the Nebraska Forest Service's Fire Control Program. These programs have provided training, Federal Excess Property vehicles, and equipment for controlling wild-fires, and they receive excellent public support. Because of the fire protection, ponderosa pine has been able to expand its range.

During the 1994 inventory, diameter growth rates of up to one-third of an inch per year were found for ponderosa pine on good sites. With this potential growth rate and the dates of establishment, it is not surprising that a significant level of the current ponderosa pine resource is of sawtimber-size.



Figure 13.—This stand of sawtimber-size ponderosa pine, located in Dawes County, Nebraska, is a typical sight in the Pine Ridge.

The current size-class distribution offers many excellent management opportunities. The income sawtimber represents can offset the costs of owning land, pay for thinning or other management, and provide a sizable profit as well. The occurrence of vegetative management activities, including tree harvesting, helps to ensure that the next generation of trees becomes established for the long-term health and productivity of Nebraska's forests. Additionally, having a growing resource in the medium and smaller size classes provides another opportunity. Trees tend to react to management more effectively when younger and smaller. Nebraska's current stand-size distribution, in combination with its potential to improve stocking, indicates that the State has many forestry opportunities.

Average Age Class

In 1983, the largest area of timberland was in the 31- to 40-year-old age class with 92 thousand acres. Comparatively, in 1994, the 41- to

50-year-old age class had the most area of timberland with 180 thousand acres (fig. 14). Other age classes in 1994 with large areas of timberland included the 21- to 30-year-old, 31- to 40-year-old, and 61- to 70-year-old classes.

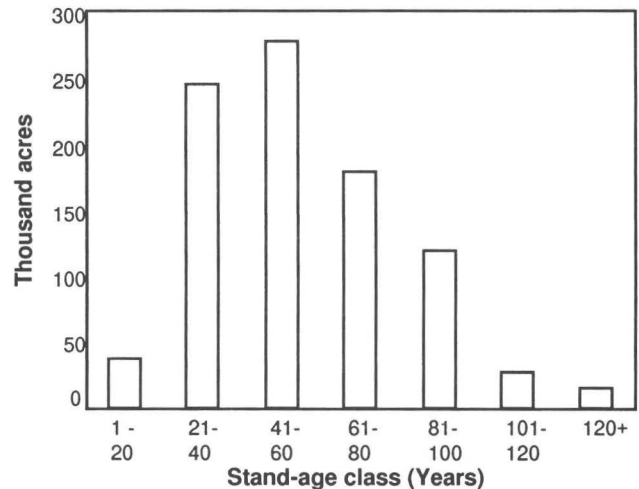


Figure 14.—Timberland area by stand-age class, Nebraska, 1994.

Nebraska has an excellent distribution of stand ages: 31 percent of stands are less than 40 years old; 51 percent are between 40 and 80 years in age; and 18 percent are more than 80 years old. This age-class distribution exhibits the potential for effective management because younger trees respond best to timber stand improvement (TSI) efforts such as thinning and pruning.

In 1994, Nebraska had more than 14 thousand acres of timberland that were more than 120 years old. This age class is generally accepted as the threshold for "old forests." Although most interest in old forests is found in the Western United States, Nebraska does have old forests that make important ecological contributions to the quality of the State.

Number of Trees

In 1994, there were 304.5 million live trees more than one inch in d.b.h. on Nebraska's timberlands. Of this total, 212.2 million were considered growing-stock trees and 92.3 million were considered non-growing-stock trees. With a statewide population estimated at 1.6 million in 1994 (Bureau of the Census

1996), there were approximately 190 timberland trees for each Nebraskan. If the trees in urban areas, in narrow wooded strips, and other non-timberland areas are also considered, this number would easily surpass more than 200 trees for each Nebraskan.

Non-growing-stock trees consist of non-commercial species such as hawthorn (*Crataegus* spp.), Osage-orange (*Maclura pomifera*), diamond willow (*Salix bebbiana*), and eastern hophornbeam (*Ostrya virginiana*) as well as rough and rotten trees of commercial species. More than 30 percent of the total number of trees in Nebraska in 1994 were considered non-growing-stock trees, a high percentage compared to States further east. The primary reason for such a high percentage of non-growing-stock trees is the tree height criterion. To qualify as a growing-stock tree, the tree must have the capability to produce one 12-foot log or two 8-foot logs with additional criteria placed on the quality of the log (see Definition of Terms in the Appendix for additional details). As previously discussed, trees in Nebraska often do not attain the heights typical of these same species in more easterly regions due to climatic restrictions. As a result, trees in Nebraska have a higher likelihood of being classified as non-growing-stock trees than in other States.

All diameter size classes increased between inventories; the largest increase occurred in the 1- to 5-inch size class. The number of trees in the larger size classes increased by 77 percent between inventories. In 1983, there were 5.2 million trees greater than 15 inches in d.b.h. By 1994, the number of trees in this size class had increased to 9.2 million. This size class is of interest because this is where the economic value, from a timber supply viewpoint, is focused.

The total number of ponderosa pine trees decreased between inventories in almost all size classes, primarily due to natural stand thinning and harvesting. In the same time period, the number of eastern redcedar trees increased in all size classes. The other commercial species that underwent a significant change between inventories was hackberry, which increased by more than 120 percent (10.7 million hackberry trees in 1983 compared to 23.6 million in 1994).

Volume

Volume is presented for both growing stock and sawtimber. Growing-stock volume is the volume of wood on timberland in growing-stock trees at least 5 inches d.b.h., from 1 foot above the ground to a top diameter of 4 inches d.b.h., less rot or other defects that reduce the yield for forest products. Sawtimber volume is a subset of growing-stock volume and is the volume of wood on timberland in trees from the stump to a minimum 7 inches top diameter outside bark (d.o.b.) for conifers and 9 inches d.o.b. for deciduous species.

Growing-Stock Volume

Growing-stock volume in Nebraska increased from 587 million cubic feet in 1983 to 854 million cubic feet in 1994, an increase of 45 percent. With a total increase of 267 million cubic feet in 11 years, Nebraska experienced an average increase of about 24 million cubic feet of growing-stock volume each year between 1983 and 1994.

In 1994, hardwood species accounted for 75 percent of the total growing-stock volume in the State. The primary hardwood species, in terms of growing-stock volume, were cottonwood (306 million cubic feet), bur oak (104 million cubic feet), and green ash (57 million cubic feet). Cottonwood is by far the dominant species in growing-stock volume in Nebraska (fig. 15). Bur oak, basswood, and elm all more than doubled in their total growing-stock volume between 1983 and 1994. All the other hardwood species groups, except for willow, increased in total growing-stock volume between inventories.

Both major conifer species (ponderosa pine and eastern redcedar) increased in total growing-stock volume between 1983 and 1994. Ponderosa pine increased from 143 million cubic feet in 1983 to 167 million cubic feet in 1994. Eastern redcedar increased from 16 million cubic feet of growing-stock volume in 1983 to 42 million cubic feet in 1994, an increase of more than 160 percent in just 11 years.

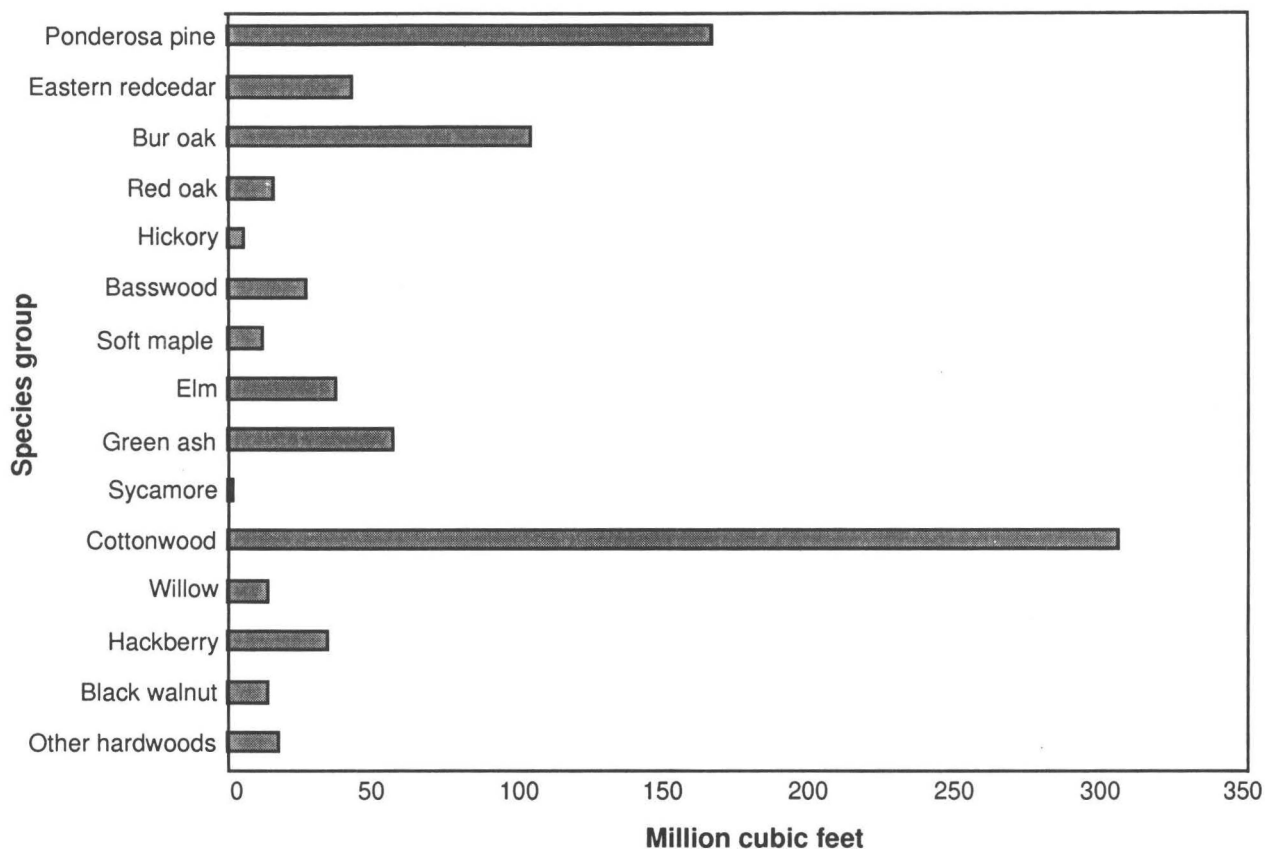


Figure 15.—Growing-stock volume by species group in Nebraska in 1994.

Total growing-stock volume increased in every diameter class between inventories. The largest increases occurred in the larger diameter classes. In those classes, cottonwood, ponderosa pine, bur oak, basswood, green ash, and hackberry were the dominant species.

Compared to the volume in deciduous species, a larger proportion of coniferous volume was in the smaller diameter classes. This agrees with the tree physiology of the two groups of species. Both ponderosa pine and eastern redcedar, with their greater rate of taper, have different growth forms than most of the deciduous species in Nebraska. As a result, they do not typically grow as large as many of the deciduous species.

An indication of the improving forest condition in Nebraska is the increasing volumes per acre on timberland. In 1983, Nebraska averaged 915 cubic feet per acre, but by 1994, this average had risen to 951 cubic feet per acre. As a comparison, the Lake States averaged about 1.2 thousand cubic feet per acre of growing-stock volume in their most recent

inventories (Schmidt *et al.* 1997); Missouri had a statewide average of about 670 cubic feet per acre in 1989 (Spencer *et al.* 1992); and Iowa averaged about 856 cubic feet per acre in 1990 (Brand and Walkowiak 1991).

The primary reason Nebraska's current average volume per acre compares favorably with adjoining States is the amount and size of cottonwood in the State. Analysis of the growing-stock volume per acre by forest type reveals that cottonwood, with an average of 2.2 thousand cubic feet per acre, had, by a large margin, the greatest stocking of all of the forest types in Nebraska in 1994 (fig. 16).

In addition to cottonwood, the oak-hickory and maple-basswood forest types averaged more than a thousand cubic feet of growing-stock volume per acre in 1994. The different growth form of eastern redcedar and its smaller average stand size were exhibited in the volume per acre averages. With an average of only 430 cubic feet per acre, the eastern redcedar forest type has by far the lowest average volumes per acre in the State.

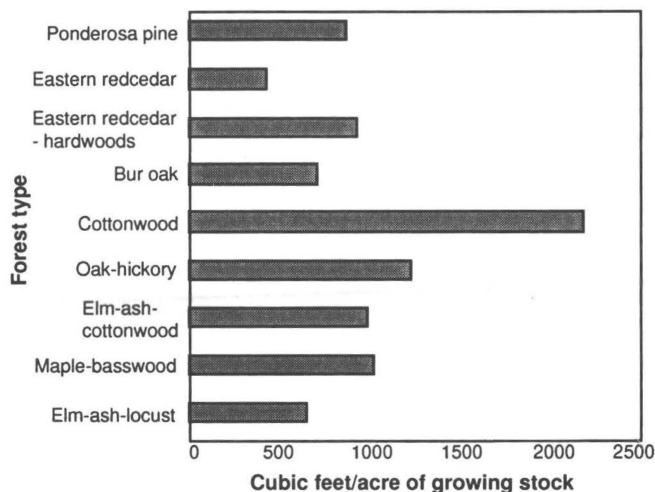


Figure 16.—Average growing-stock volume per acre for selected forest types in Nebraska in 1994.

Sawtimber Volume

Total sawtimber volume increased from 2.2 billion board feet in 1983 to 3.4 billion board feet in 1993, a 54-percent gain. As with growing-stock volume, hardwoods accounted for about 75 percent of the total sawtimber volume in Nebraska in 1994. The same species that dominated in terms of growing-stock volume also dominated in terms of sawtimber volume, with cottonwood leading the way. In 1994, cottonwood accounted for 43 percent of the total sawtimber volume in the State.

By 1994, ponderosa pine sawtimber volume had grown to 711 million board feet, an increase of 132 million board feet in the 11 years between inventories. As in 1983, most of the ponderosa pine sawtimber volume was in the 11- to 19-inch diameter class. In 1994, only 14 percent of the total ponderosa pine sawtimber volume was in trees greater than 19 inches d.b.h. As a comparison, in 1994 cottonwood had 79 percent, hackberry 38 percent, and green ash 29 percent of their total sawtimber volume in trees larger than 19 inches d.b.h.

Quality of the Sawtimber Volume

Sawtimber tree quality was assessed by the field crews as they assigned a butt log grade to coniferous sawtimber-size trees and a tree grade to hardwood (deciduous) sawtimber-size trees on about one-third of the field plots. The

grades used were based on external characteristics of the trees as indicators of internal quality. (Indicators such as diameter, number of clear faces on the bole, presence of decay, and amount of sweep and crook, were used—please see Tree and Log Grades in the Appendix for more information.) The volume by grade from this sample represents the volume in all trees in Nebraska with a similar log or tree grade.

Smaller diameter trees tend to be assigned lower grades due to the definition of grades requiring minimum diameters. Since 28 percent of the sawtimber-size trees in Nebraska in 1994 were less than 14 inches d.b.h., tree quality is weighted toward the lower end of the quality spectrum (especially for conifers). As these trees increase in diameter, their average tree quality will increase. In the analysis of sawtimber quality data, grade 1 represents the highest quality and grade 4 represents the lowest quality. In 1983, hardwood trees were graded by log rather than by tree so comparisons to past quality are difficult to obtain.

In 1994, 26 percent of Nebraska sawtimber was in grade 1, 26 percent in grade 2, 44 percent in grade 3, and 4 percent in grade 4. Overall, having more than 50 percent of a State's sawtimber volume classified in the top two grades is excellent. This high percentage ranks Nebraska as one of the top States in the Central United States in terms of sawtimber quality.

There was a difference in quality between softwoods and hardwoods in Nebraska in 1994. For example, only 6 percent of the ponderosa pine sawtimber rated as log grades 1 and 2 (fig. 17) compared to 66 percent of the hardwood species in grades 1 and 2. The lower average grades for ponderosa pine were due to smaller average diameters and greater rates of taper.

All eastern redcedar sawtimber volume in Nebraska in 1994 was graded as being in log grade 3. Because of eastern redcedar's growth habit of retaining its lower limbs and above average taper, it is rarely graded in the better quality classes. Individual analyses of tree quality for other species can be completed by using table 15 found in the Appendix.

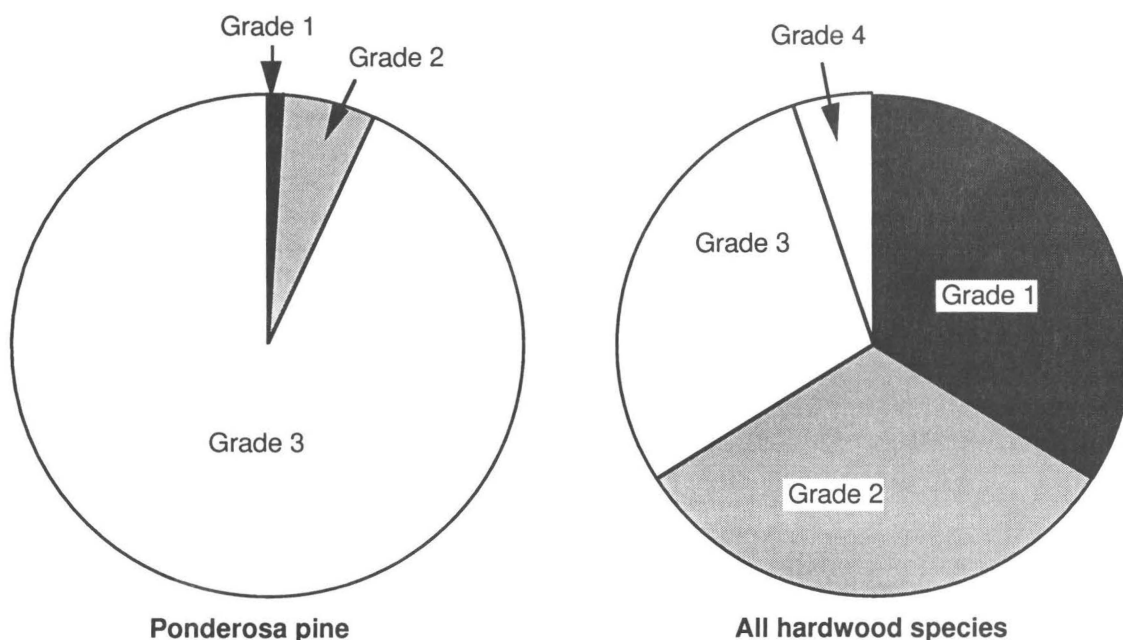


Figure 17.—*Ponderosa pine sawtimber log-grades and hardwood species sawtimber tree-grades in Nebraska in 1994.*

Non-Growing-Stock Volume

The 854 million cubic feet of growing-stock volume, including the 3.4 billion board feet of sawtimber, does not include the volume in short-log, rough, rotten, or dead trees (non-growing-stock trees). Yet these trees provide important noncommodity as well as commodity values to Nebraska. Many of these trees are preferred as habitat for songbirds, other wildlife, insects, and other plants and animals that contribute to species diversity. Non-growing-stock trees provide visual relief from the sameness often associated with croplands and rangelands, and are used for firewood, lumber, veneer, chips, and many other wood products (fig. 18). Future commodity use of these trees will increase as the technology to use short sections of trees is more widely accepted.

In 1994, there were 98 million cubic feet in short-log trees, 313 million cubic feet in rough trees, 37 million cubic feet in rotten trees, and 28 million cubic feet in salvable dead trees in Nebraska. In total, these 476 million cubic feet represent an important source of wood fiber that supplements the growing-stock volumes in the State.



Figure 18.—*This black walnut tree is a good example of a short-log tree. Although this tree is not classified as growing stock, it is of high value.*

CAUSES OF CHANGE IN NEBRASKA'S FORESTS

Forests are dynamic, continually undergoing changes. Changes in area, volume, species composition, number of species, and size all occur on a continual basis from plant succession, growth, natural mortality, and/or environmental and human-caused disturbances.

Plant Succession

Plant succession, the natural process of gradually replacing one plant community with another, continues to change the forest. Succession takes place as pioneer plant communities, such as cottonwood, become established following a disturbance (Johnson 1994). These initial plant communities modify their physical environment, which enables other plant communities to establish. Examples of modification of the physical environment include changes in soil organic matter, shade, soil moisture, soil temperatures, and soil nutrients.

The forests of Nebraska have undergone extensive disturbance from flooding, clearing for agriculture, and logging. After these disturbances, the forests responded with pioneer species that modified the micro-climate and eventually enabled other forest types to establish as understory plant communities. As succession progresses, early-successional species are supplanted by more shade-tolerant species and the forests often convert to other forest types.

Growing-Stock Growth

Growth is an important consideration when discussing forest resources because it is an indication not only of the change in the volume of wood but also of the stability, vigor, and stage of development for the stand. Growth is expressed as average annual net growth and current annual net growth for both growing stock and sawtimber (net growth is gross growth minus mortality). For the 1994 inventory of Nebraska's forest resources, average annual net growth is based on the average growth rate between 1982 and 1993, and current net growth is based on 1993.

Average annual net growth is a good indication of the average growth rate over time because it averages out periodic factors, such as weather, that could alter the growth rate in a particular year. If one year had significantly different weather conditions and/or abnormal tree mortality, its current growth would be quite different from the average and would probably not be a good indication of the true growth rate. Therefore, average annual net growth is an indicator of overall growth potential over time. However, Nebraska's forests have

changed during the 11 years between inventories. With the long time period between inventories, factors occurring more than 10 years ago affect the average annual net growth rate. Thus, current annual net growth is an indicator of the most recent stand conditions. Both growth indicators are discussed where appropriate.

Between 1983 and 1994, Nebraska's timberlands averaged 14.3 million cubic feet of net growth per year for growing stock. As a comparison, growing-stock current net growth was 12.0 million cubic feet in 1982 and 15.8 million cubic feet in 1993. Statewide, Nebraska averaged about 16 cubic feet of net growth per acre per year between inventories. Nebraska's average annual net growth rate of 14.3 million cubic feet represents about 1.7 percent of the State's total growing-stock volume. This growth rate is lower than what could be expected, primarily due to lower stocking rates rather than to site productivity. Nebraska has an excellent opportunity to increase growth rates through sound forest management practices.

With most of Nebraska's timberlands being hardwoods, most of the average annual net growth was also in hardwoods (70 percent). The oak-hickory forest type had the greatest average annual net growth rate at 27 cubic feet per acre, followed by cottonwood with 24 cubic feet per acre, eastern redcedar with 22 cubic feet per acre, and maple-basswood with 22 cubic feet per acre (fig. 19).

The higher growth rates in the oak forest types (bur oak, oak-hickory) were surprising because these types are often viewed as being slower growing than some other forest types. However, net growth is a reflection of both growth potential and stocking. Many of the oak stands in Nebraska have better stocking rates than some of the other forest types. The more trees per acre, the more wood fiber that can be grown until the site reaches its maximum carrying capacity.

Growth Can Be Greatly Increased

In 1994, potential annual net growth on timberlands in Nebraska was estimated to be 48.5 million cubic feet (table B). This potential growth rate is about 330 percent higher than the average annual net growth measured over

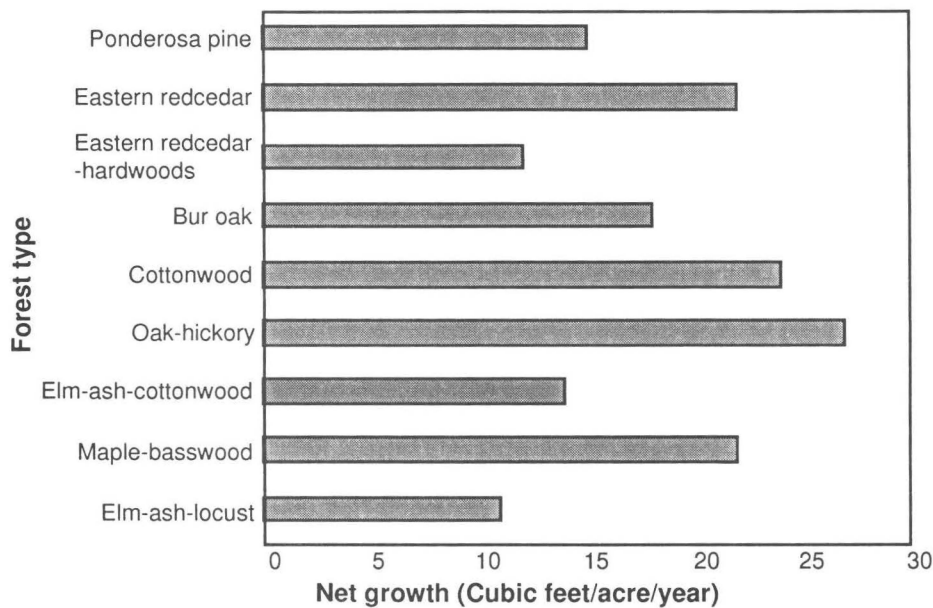


Figure 19.—Average annual net growth per acre for selected forest types between 1983 and 1994 in Nebraska.

the last inventory cycle. While the net growth rates that have been experienced are currently below expectations, Nebraska's timberlands have the potential to greatly increase their net growth.

Potential annual net growth is based on the potential annual volume of growth per acre of fully stocked natural stands at culmination of mean annual increment in each potential productivity class. We multiplied the area in each productivity class by the midpoint of the range of growth in that class to estimate the potential growth in the State. Spurr and Vaux (1976) discounted an estimate of potential growth by 10 percent to adjust for the differences between actual stand conditions and the fully stocked, natural conditions implicit in the use of potential productivity data. Thus, we

discounted the potential productivity data by 10 percent to more accurately reflect Nebraska's current stand conditions.

The advantage of increasing net growth is that it does not take additional acres of timberland to increase the future availability of forest resources. With ever-increasing populations, potential pressure for increasing agricultural production to feed the growing numbers of people, and ensuing pressures on the limited land base for many other land-uses, the potential for increasing production by expanding the timberland acreage base in Nebraska will be limited. The most efficient method of meeting the increasing demand for wood fiber is through expanded production on the existing timberlands through more intensive management. In addition, increasing the production

Table B.—Estimation of potential annual net growth on timberland, Nebraska, 1994

Potential productivity (Feet ³ /acre/year)	Timberland area	Potential net growth per acre	Unadjusted total potential growth	Adjusted total potential growth (discounted 10%)
	M acres	Feet ³ /acre/year	—Thousand feet ³ /year—	
120 +	23.4	142.0	3,322.8	2,990.5
85 - 119	172.8	102.0	17,625.6	15,863.0
50 - 84	269.5	67.0	18,056.5	16,250.9
20 - 49	432.7	34.5	14,928.2	13,435.4
	898.4		53,933.1	48,539.8

from the existing acres will result in greater value of the timberlands and resulting increased income for the landowners. As income from their timberlands increases, landowners are more likely to retain the land in trees and not attempt to convert their forests to other uses.

Potential growth can be even further advanced if intensive forest management techniques, such as thinning and planting trees are applied. With the potential growth and excellent site conditions, intensive forest management could become an important investment for Nebraska's future that would provide many widespread benefits.

Sawtimber Growth

Between 1983 and 1994, Nebraska averaged 66 million board feet of growth per year. As a comparison, the State had current annual growth rates of 56 million board feet in 1982 and 83 million board feet in 1993. On a per acre basis, Nebraska grew 73 board feet of sawtimber volume each year between 1982 and 1993 on timberlands. In most regards, sawtimber growth followed the same pattern as that found for growing stock, lower than expected growth rates in most stands due to low stocking levels.

Both sawtimber and growing-stock growth are negatively impacted by herbicides that can drift into forests and wooded strips adjacent to croplands. Herbicides directed at controlling broadleaf weeds can be very harmful to trees. If these chemicals are applied when it is windy, they can drift and the crowns of the trees may intercept the herbicide. In addition to herbicides applied to croplands, other herbicides are applied in pastures to control noxious weeds such as Russian thistle (*Salsola kali*). If these herbicides are broadcast, they can negatively impact adjacent trees. In both cases, aerial application of the herbicides is the most damaging due to the potential for drift.

Herbicides lower the average growth rate for trees in Nebraska and can even kill trees. Some woody species are more susceptible to herbicides than others; unfortunately, black walnut is one of these species. Many forest stands with black walnut present in eastern Nebraska have damaged crowns, low growth rates, and dead trees due to herbicides that drifted.

Mortality

Tree mortality is the source of vital components of a stable forest ecosystem (fig. 20). Many insects, diseases, and abiotic factors often cause snags (standing dead trees) or cracks, holes, and crooks in the tree. This lowers the timber value but can raise the value of the tree for wildlife. For example, many species of wildlife rely on decay fungi to initially create rotten pockets in older trees, which are then used as nesting sites as well as locations for feeding and roosting. Snags can serve as nesting and roosting sites. Coarse woody debris is important for both terrestrial and aquatic species; it provides both habitat and food for the many fish found in Nebraska's streams and rivers.



Figure 20.—This snag continues to provide wildlife habitat.

It is often difficult to determine the cause of a tree's death; typically, more than one factor is involved. Often, one factor will weaken the tree to the point where a second factor, unable to cause mortality by itself, results in death. Thus, causes for most mortality are unknown.

Of the known causes of mortality in Nebraska, stem decay organisms, weather factors such

as flooding and drought, fire, Dutch elm disease, and foliage diseases were the leading causes between 1983 and 1994. The mortality due to both herbicides and livestock grazing was lower than expected. What typically occurs for both of these factors is that they lower the health and vigor of the tree to the point where a pest or disease can attack the weakened tree and cause death. Without the impacts of herbicides or livestock grazing, the trees normally could withstand many of the pests and diseases that may eventually kill them.

Statewide, average annual mortality as a percent of total volume was 1.6 percent for growing stock and 1.3 percent for sawtimber. Species with an above-average mortality rate were cottonwood, elm, and ponderosa pine. All three of these species averaged more than a million cubic feet of mortality each year between inventories.

Eastern redcedar, bur oak, red oak, silver maple, sycamore, and hackberry had below-average rates of mortality. These species currently do not have any major pests or diseases that threaten their survival. With their strong potential growth and low rate of mortality, they are expected to continue to increase their importance in the forests of Nebraska.

Cottonwood mortality averaged more than 5.8 million cubic feet per year between 1982 and 1993. This high mortality rate for cottonwood was one of the reasons for the lower net growth rate for this species. (Net growth is gross growth minus mortality.) Cottonwood averaged more than 8.6 million cubic feet of gross growth per year, but due to mortality of 5.8 million cubic feet, had a net growth rate of only 2.8 million cubic feet. With the lack of regeneration, future mortality for cottonwood in Nebraska is expected to increase. Eventually, due to the advancing age of this species, its relatively short lifespan, and resulting higher rates of mortality, cottonwood will be replaced by species such as hackberry and green ash as the primary species in Nebraska.

As Nebraska's forests continue to mature, mortality rates will probably increase because many stands will begin to reach their maturity or become overmature (as in the case of cottonwood). As these stages are reached, the potential for mortality increases.

Removals

Because of the wide variations in the removal rate between inventory periods, analysis of the components of timber removals focuses on both current removals as well as average annual removals. Current removals presented here are for 1993; average annual removals are the 11-year average between 1982 and 1993. The reader is cautioned to recognize whether the data presented are the average result for the 11 years between inventories or are for only 1993.

Growing-Stock Removals

Average annual timber removals of growing stock between 1982 and 1993 were 6.6 million cubic feet. This is an average and considers the total time between inventories. In 1982, current timber removals from growing stock were 9.4 million cubic feet; in 1993, they were 12.5 million cubic feet. In the mid- to late-1980's, harvesting in Nebraska was much lower than in 1993. As a result, average annual timber removals are much lower than the current annual removals rate.

In 1993, softwoods accounted for 45 percent of the total removals of growing stock compared to only 6 percent in 1982. In 1993, the greatest removals of growing stock were from ponderosa pine and cottonwood (fig. 21).



Figure 21.—Pallets, such as those made in this plant, are one end product of harvesting cottonwood. Pallet manufacturing continues to be one of the primary uses of cottonwood sawtimber in Nebraska.

Between inventories, there was a shift in the removal rate for several species from Nebraska's timberlands. In 1982, removals were dominated by hardwoods, most notably cottonwood and bur oak. Average annual removals from cottonwood dropped from an average of 3.2 million cubic feet to 2.3 million cubic feet. Bur oak removals have dramatically declined from the average annual removals rate of 2.2 million cubic feet in 1982. Average annual removals of growing stock for bur oak between 1982 and 1993 were only 281 thousand cubic feet and current removals were 325 thousand cubic feet in 1993.

When we consider both average annual and current removals, net growth exceeds removals on a statewide basis (fig. 22). These are statewide averages, and the growth to removals ratios will vary by species. If net growth was improved (as displayed in table B), the growth to removals ratios would improve further and allow for increased harvesting on a statewide basis. Based on the potential increase in net growth and the improving markets for timber products, investment in forestry in Nebraska should receive strong consideration.

Markets for individual species vary over time. The use of black walnut in manufacturing furniture is a good example. The use of dark woods (such as black walnut) versus lighter woods (such as red oak) varies as consumers' tastes change over time. As a result, prices fluctuate. As prices fluctuate, harvesting responds with either increases or decreases in the volume marketed. These economic factors change quickly, and markets for timber products, especially for saw logs, can fluctuate widely. Fortunately, most species come into favor at some time. Landowners should be patient with their timber resources because it can prove profitable to wait for a strong market for their particular species.

In addition to the growing-stock removals, it was estimated that 2 million cubic feet of non-growing-stock volume were annually removed during the 11 years between inventories. Most of these removals were from trees that did not meet the minimum requirements to qualify as growing-stock trees but that were of sufficient size and quality to be bought and sold. The rate of harvest for non-growing stock has risen

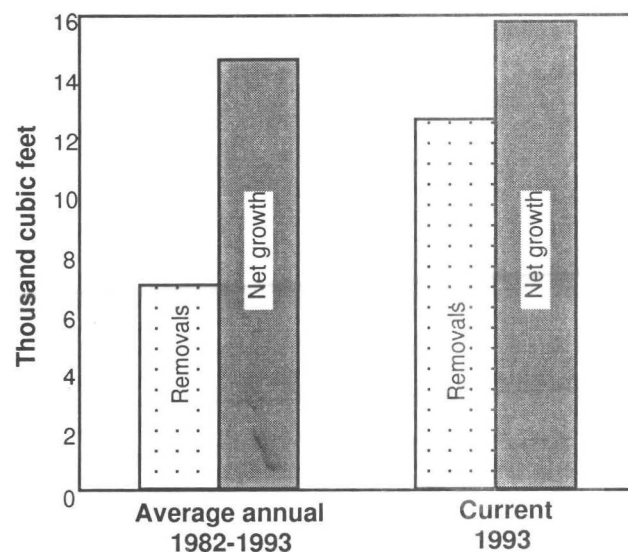


Figure 22.—Comparison of growing-stock net growth and removals for 1982 - 1993 and for 1993.

over the past few years. Although the average annual removal rate was 2 million cubic feet, the current removal rate was 12 million cubic feet. The vast majority of this current removal was for firewood. The current inventory by NCFIA included a more intensive effort to account for firewood usage in Nebraska. A specialized survey was conducted and resulted in a separate publication, *Residential Fuelwood Consumption and Production in Nebraska, 1994* (May 1996). In the past, the removal rate for non-growing-stock volume was probably underestimated, which accounts for the large difference between average annual removals and current removals of non-growing-stock volume.

Timber removals from growing stock is made up of three components: roundwood products, logging residues, and other removals (see Definitions of Terms in the Appendix). The roundwood products portion includes veneer logs, saw logs, and others (firewood, posts, poles, etc.) and accounted for 73 percent of the current 1993 total removals. Logging residue made up 9 percent of the total, and other removals accounted for the remaining 18 percent. Much of the logging residues and "other removals" are left on site and are byproducts of the harvesting process. In some cases, these residues are used for firewood or wood chips, but across Nebraska most of this volume is generally left in the woods.

Ponderosa Pine Growth to Removals Ratio

The removal rate for ponderosa pine increased dramatically between inventories. Currently, the average annual removal rate for ponderosa pine, 2.8 million cubic feet, exceeds the average annual net growth rate of 2.5 million cubic feet (a growth to removal ratio of 0.9/1.0). Generally, over the long term, a growth to removal ratio of more than 1.0/1.0 is desired because it indicates long-term sustainability. Over a long period of time, the goal for forest landowners and managers is to grow more than what is removed.

Current removals of ponderosa pine from growing stock were estimated at 5.3 million cubic feet for 1993. Current growing-stock growth for ponderosa pine was estimated at 2.5 million cubic feet. The current removal rate was above the average annual rate, while the current growth rate was about equal to the average annual rate. This current situation further points out the difference between growth and removals for ponderosa pine.

The current level of removals for ponderosa pine is not of major concern because for many years growth far exceeded removals, resulting in an accumulation of volume. This is similar to saving money; if you save for many years, you accumulate wealth that can be used at a future date. For many years, Nebraska accumulated ponderosa pine volume that is now being harvested. This situation can be carried on for the short term. With the current strong market for ponderosa pine stumpage, this is a good example of waiting for species values to increase before selling. In the mid-1980's, ponderosa pine stumpage averaged about \$10 per thousand board feet. In 1993, ponderosa pine stumpage values of more than \$100 per thousand board feet were common. As a result, the time has been ripe for reaping the benefits of accumulating volume in ponderosa pine for the past 50 years (fig. 23).

Ponderosa pine has the capability to increase its total production by more than 300 percent. If we use the same calculations as were completed for determining potential annual net growth (table C), the estimated total potential annual net growth for ponderosa pine is 8.6 million cubic feet per year with full stocking. The average annual net growth rate between 1983 and 1994 was 2.5 million cubic feet per year. If the ponderosa pine resource were



Figure 23.—Removals of ponderosa pine have risen dramatically over the past few years in Nebraska.

managed to its full potential, growth would far exceed removals. An increase of less than 15 percent would allow future harvest levels to continue indefinitely at the present level. The key to this is good management of the resource.

The landowners with ponderosa pine acreage need to work closely with professional foresters to improve stocking level. Improved stocking would help to ensure that the current harvesting level does not go beyond the capability of the timberlands. The long-term health and vigor of the ponderosa pine timberlands should be the primary objective for all concerned. Full stocking improves the health and vigor of the stand and improves the economic potential from the forest. As long as professional foresters and landowners maintain this as their main goal, the current level of harvesting appears to be a sound forestry practice for the short term. Good land management will allow significant increases in pine production while maintaining and enhancing grass production on the ranches in Nebraska's pine growing areas.

Sawtimber Removals

Between 1982 and 1993, average annual sawtimber removals were 29 million board feet; in 1993, current sawtimber removals were 64 million board feet. Average annual removals of sawtimber for softwoods were almost 14 million board feet for the 11 years between inventories. Current removals of softwood sawtimber were 28 million board feet

Table C.—*Estimation of potential annual net growth for ponderosa pine on timberland, Nebraska, 1994*

Potential productivity (Feet ³ /acre/year)	Timberland area	Potential net growth per acre	Unadjusted total potential growth	Adjusted total potential growth (discounted 10%)
	M acres	Feet ³ /acre/year	—Thousand feet ³ /year—	
120 +	2.0	142.0	284.0	255.6
85 - 119	33.7	102.0	3,437.4	3,093.7
50 - 84	33.1	67.0	2,217.7	1,995.9
20 - 49	105.2	34.5	3,629.4	3,266.5
	174.0		9,568.5	8,611.7

in 1993. Average annual removals for hardwoods were almost 16 million board feet. Current removals of hardwood sawtimber were 36 million board feet for 1993. As pointed out for growing stock, recent removals have been greater than the average between inventories. Although ponderosa pine has received most of the attention in Nebraska, the hardwood removal rate has also increased.

BIOMASS

Biomass is measured by weight. Species that have higher weights per volume (specific gravity) such as oak and hickory will generally have higher biomass yields. In addition to the weight factor, biomass yields are another indication of stocking rates. As previously mentioned, the oak-related forest types have better stocking rates than other forest types and thus result in greater biomass yields.

The total aboveground biomass of all live trees (green weight) on timberlands in Nebraska amounted to 56.7 million green tons in 1993, an average of 63 green tons per acre. The elm-ash-locust forest type accounted for the most biomass with 24 percent of the total. However, elm-ash-locust represented 26 percent of the total area of timberland. Thus, while most biomass was in this forest type, it was below average on a per acre basis. As a comparison, the oak-hickory forest type accounted for 9 percent of the total biomass in Nebraska but represented only 6.5 percent of the total area of timberland (showing an above-average biomass per acre). Additional details related to biomass yields are presented in the Appendix tables.

The aboveground biomass estimates are for all live trees. In addition, we estimated shrub biomass on timberlands in Nebraska. Shrub biomass includes live tree seedlings less than 1 inch d.b.h., as well as the biomass in tall woody perennial shrubs and other low perennial shrubs. The mean shrub biomass on timberlands in Nebraska in 1994 was 1.24 green tons per acre green weight. This total biomass was comprised of an average of 0.35 green tons per acre from tree seedlings (29 percent), 0.84 green tons per acre from tall woody perennial shrubs (67 percent), and 0.05 green tons per acre from other low perennial shrubs (4 percent).

The largest mean tree seedling biomass was in the green ash, eastern redcedar, hackberry, and ponderosa pine species groups; all averaged more than 0.05 green tons per acre of tree seedling biomass. Among the tall shrubs, chokecherry (*Prunus virginiana*) and dogwood (*Cornus florida*) accounted for the greatest mean biomass per acre. Gooseberry (*Ribes* spp.) had the greatest mean biomass among the low shrubs.

URBAN AND COMMUNITY FORESTRY

Nebraska's population of 1.6 million people lives predominately in the eastern one-third of the State. The natural resource base is an area that can be improved through management, thus having a positive impact on quality of life. This natural resource base includes the soil, trees, shrubs, streams, air, and animals that inhabit our suburban, urban, and rural communities. Urban and community forestry deals with the interaction of people and forest resources to ensure long-term community and ecological sustainability, improved environmental quality, and improved quality of life.

Community tree resources provide a range of environmental benefits: energy efficiency, carbon sequestration, oxygen production, erosion control, water quality, species diversity, and noise reduction. They improve peoples' physical and mental health and enhance spiritual, emotional, and cultural well-being.

In 1994, there were 95 communities certified as a Tree City USA in Nebraska. These communities have made a commitment to their forest resource and, as a result, have made a commitment to the quality of life in their cities and towns. The Urban and Community Forestry Program of the Nebraska Forest Service has a long history of providing technical assistance to homeowners, city foresters/city managers, and garden centers/nurseries. In addition, this program offers educational training programs for arborists, urban and community tree boards, and interested private individuals.

In 1994, the Urban and Community Forestry Program estimated that there were 426 thousand trees on public land in the 135 communities in Nebraska that had been inventoried. The estimated value of these trees was \$563 million. Generally, communities in Nebraska average about 50 percent of their tree resource on public lands and about 50 percent on private lands. Thus, in 1994, the 135 communities in Nebraska had a total urban tree resource value of more than a billion dollars.

FOREST HEALTH

Forest stressors such as drought, storms, late spring frosts, diseases and insects, and the maturing of some species have played a significant role in shaping the forests of Nebraska. Generally, Nebraska's forests are quite stable and productive. However, some recent localized events have negatively affected the overall forest's vigor. An example of these events is the severe weather in 1991 that led to the death of more than 250,000 trees on public lands alone (Hergenrader 1993).

Currently, Siberian elms planted in many of the early windbreaks and shelterbelts across the State are reaching the end of their lifespan (fig. 24). These trees are dying out, and natural regeneration by elm and other species such as hackberry, green ash, and eastern redcedar is not replacing the lost elms. These early

plantings have provided a lifetime of service; their loss will negatively impact a wide variety of other natural resources and their replacement should be seriously considered.



Figure 24.—Many early windbreak plantings had a large component of Siberian elm. As these trees mature, management activities such as underplanting or row replacement are needed.

NEBRASKA'S FOREST-BASED ECONOMY

Nebraska's forests contribute significantly to the social, economic, and environmental well-being of its citizens. The economic contribution of these forests includes employment opportunities, wealth creation, and the production of commodities as well as non-market goods. Total employment in timber-based industries was estimated to be more than 460 people with a total payroll approaching \$6.3 million. These industries had a total value-added by manufacture of more than \$34.5 million.

NON-TIMBER BENEFITS OF NEBRASKA'S FOREST RESOURCES

Nebraskans take pride in their forests and recognize the many benefits associated with this valuable resource (fig. 25). Nontimber products from Nebraska's forest resource, while sometimes difficult to quantify, often have more value than those from fiber production. Nontimber forest resource values include biodiversity, wildlife habitat, outdoor recreation, water quality, soil erosion protection and enhancement, and visual diversity/aesthetics. Each resource and use of the forest is an integral part of the whole forest;



Figure 25.—Frontier County residents receiving their Tree Farm Award.

each adds its diversity and values to those of other resources.

Although we generally recognize the positive value associated with forests in Nebraska, we also recognize that in particular situations trees can be detrimental to the overall land management objective. For example, along the Platte River, land managers are concerned about the expansion of the forest resource and its impact on sandhill crane (*Grus canadensis*) populations. The potential for encroachment of woody vegetation into virgin tall-grass prairies in eastern Nebraska is of concern. Expansion of eastern redcedar into highly productive rangelands concerns ranchers because of the potential negative impacts related to handling livestock and reduced forage production.

Species Diversity

Nebraska's forested ecosystems are represented by a number of biotic and abiotic components combined into a broad and diverse landscape. In the case of forests, the kinds of vegetation present are critical to the kinds of animals that can be supported.

More than 60 different native tree species and more than 30 native woody shrub species have been identified in Nebraska's forests (Pool 1984). The forest also contains other biotic components that are essential to its overall stability and community functions. The relationship of the many forests and their key attributes to one another create different, but important habitats. Examples include the edge between various forests or land-uses and the presence of aquatic systems.

Forest-Related Wildlife Habitat

The diversity of Nebraska's forest resource provides a complex habitat for many wildlife species. Those wildlife contribute to the quality of life by giving people the opportunity to hunt and fish, watch or photograph, or just know that wildlife exist and are a part of the total complex of our world. Many people are very willing to spend time and money to satisfy their desire for a wildlife-related experience.

While white-tailed deer (*Odocoileus virginianus*) may be the most easily recognized of Nebraska's forest residents, many wildlife species are supported by a variety of forest ecosystems in the State. Anyone who has spent much time in Nebraska's forests will recognize the important role they play in maintaining the State's wildlife diversity. Examples include the oak-hickory forest that rings with the chattering calls of fox squirrels (*Sciurus niger*), and the ponderosa pine forests along the Niobrara that are so critical to the survival of wild turkeys (*Meleagris* spp.).

Forest-related wildlife are a vital ingredient of the forest ecosystem. The overall population numbers of many species of wildlife are directly related to the amount and kind of woody vegetation. All the white-tailed deer, raccoon (*Procyon lotor*), squirrels, turkey, and other woodland-dependent species exist within the State because of the forest resource. If the acreage of woody vegetation were to increase,

the wildlife resource could correspondingly increase. In addition to the above species, many other species depend partially on forests/trees for their survival. Pheasants (*Phasianus colchicus*) are normally associated with farmland in Nebraska, but the availability of forest winter cover, whether found as windbreaks, wooded strips, or woodlands, has a dramatic positive influence on their population.

Several forest-dependent wildlife species are economically important because of their value for hunting and trapping. Squirrel, turkey, beaver (*Castor canadensis*), white-tailed deer, and wood duck (*Aix sponsa*) are species that can legally be taken and they depend on the forest for their survival. These species make significant contributions to the State's economy through hunting license receipts, sale of equipment, and other activities. White-tailed deer, Nebraska's most important big-game animal in terms of number of hunters and economic activity, serves as an example. In 1997, almost 30 thousand white-tailed deer were harvested, generating about \$9.4 million in expenditures (Nebraska Game and Parks Commission 1998).

Timber harvesting provides multiple benefits for Nebraska's white-tailed deer. Logging provides more feeding territory and sets back the forest's successional stages (Preece 1989). When forests reach poletimber size and larger, the trees are not as readily available for food and they shade out desirable food plants and shrubs. In 1993, more than 100 thousand acres of timberland were in the preferable sapling and seedling stand-size class, serving as the "dinner table" for white-tails.

Many birds are dependent on Nebraska's forest resource for their survival. Their needs range from nesting cavities to sources of food. Cavity nesting species such as woodpeckers (Piciformes) and owls (Strigiformes) need mature forests, while species such as brown thrashers require open, younger forests. Bird communities in mature forests are distinctive from those in early-successional stages. Generally, a complete turnover of bird species occurs after harvesting. As the forest ages, bird species diversity increases because species associated with older forests colonize the area while species associated with younger forests maintain some presence.

Beaver is a forest-related species that has experienced tremendous changes in its population. By 1900, beaver were all but wiped out in Nebraska and the rest of the United States from overharvesting (Hutchinson 1989). However, with sound management by the Nebraska Game and Parks Commission and the expansion of woody species in many riparian areas, a viable population of beavers is currently found along many rivers and streams in the State. As the forestry profession continues to become more sensitive to all forest resources, wildlife will play an increasingly larger role in determining appropriate forestry-related actions.

Small, annual temporary ponds and wetlands scattered in the forests of Nebraska are essential for the reproduction of salamanders (Urodela) and frogs (*Rana/Pseudacris/Hyla* spp.). Cool waters shaded by lowland forest also provide habitat for turtles (*Pseudemys/Chrysemys/Trionyx/Kinosternon/Chelydra* spp.).

Although the money generated by users of the forest's wildlife resources represents a quantifiable value, there are also the intangible benefits provided by just knowing that forests are teeming with hundreds of species of mammals, birds, insects, and amphibians. These intangibles are one of the greatest legacies of the State's forests.

Forest-Related Outdoor Recreation

Most of the tourism and recreation that occurs in Nebraska is related to the State's forest resources. The majority of the State and local parks owe much of their ambiance to their tree resource; most of the game wildlife species rely on woody vegetation for some part of their habitat needs, and many of the rivers and lakes that provide fishing and boating opportunities owe their water quality, in part, to the forest resource. In total, Nebraska's tourism and recreation industries rely heavily on the forest resource despite the overall perception of Nebraska not being a "forested" State.

The quality of the outdoor recreation experience is a reflection of the quality of the resource. The forest resource is a critical component of the recreation resource, directly and indirectly impacting outdoor recreation. Outdoor recreation activities that rely directly on

the forest resource include camping, picnicking, nature study, and hunting. Outdoor recreation is a prime example of the interdependence of the forest resource and its various values and products. Forest management activities such as harvesting or thinning can directly impact, positively or negatively, other forest-related activities. In addition, forest-related outdoor recreation activities impact the forest resource.

Forest Impacts on Water Quality

Nebraska's outstanding water resources provide for thousands of hours of fishing recreation, provide the lifeblood for millions of acres of croplands, and represent one of Nebraska's most recognized natural resources—the Ogallala Aquifer. In Nebraska, trees make important contributions to water quality. Many recreation activities are water based, and the quality of the experience is directly related to the quality of the water resource. In addition, a substantial number of terrestrial wildlife species depend on the water resource.

Forest and water resources interact and have direct impacts on each other. All of the almost 950 thousand acres of forest land in Nebraska influence water quality and quantity on both the surface and underground. The percent of forest cover within a watershed was found to be one of the best predictors of water quality in streams (Fandrie *et al.* 1988). Relationships between forest lands and water are complex, and a number of variables can positively or negatively impact either resource. Forest management can have beneficial as well as detrimental impacts on water quality, depending on the timing, techniques, and size of the operations.

Riparian zones are the banks and adjacent areas of lakes, rivers, and streams where additional soil moisture provides a moister habitat than that of adjoining uplands. In Nebraska, the most productive sites are found in the riparian zones. The increased production there is due to the permanent water influences on the soils and vegetation. Forested riparian zones play a critical role in maintaining Nebraska's water quality (fig. 26). Trees in riparian zones protect streambanks from erosion as their roots help to hold the soil in the bank rather than sloughing into the stream. These zones act as buffer/filter strips,

filtering out sediments and nutrients from the water as it flows through the vegetated area. Riparian vegetation slows down the water, allowing sediment and other pollutants to settle out onto the land rather than be carried into the stream or lake. Vegetation may grow through the deposited sediment, stabilizing it with roots and covering it with plants that use the nutrients that would otherwise harm downstream water quality.



Figure 26.—*This forested riparian zone serves to improve water quality while providing many other benefits.*

Forested riparian zones slow flood waters and reduce the likelihood of downstream flooding. They serve as water infiltration zones to smooth out high and low water flow periods. Water infiltrates into the forest soil during high flow periods and is released during periods of low flow.

Water temperature, habitat structure, and food availability are important factors affecting the survival of fish and are directly affected by streamside forests. Trees provide shade along Nebraska's streams, rivers, and lake edges. Shade serves to maintain lower water temperatures (a direct reflection of water quality and occurrence of algal growth) and provides

improved habitat for a diverse invertebrate community. Water temperature impacts the available oxygen in the water—as temperatures rise, oxygen levels drop. Forested riparian zones are sources of organic matter and coarse woody debris. Organic matter is necessary for the existence of aquatic insects used as food by fish. Coarse woody debris in the rivers, streams, and lakes provides food and habitat for various water-related organisms. As the percent of woody vegetation in the riparian zone increases, the percent of organic matter available to improve fisheries habitat increases.

Unfortunately, it is estimated that the area of riparian forests in Nebraska represented by narrow wooded strips has declined. About 83 thousand acres of wooded strips in 1983 were reclassified as nonforest in 1994. Many of these lost narrow wooded strips were located along riparian zones. We estimate that the primary causes of this loss were clearing for agricultural purposes, mortality due to weed control chemicals, and urban and industrial development. The increase in center-pivot irrigation systems in Nebraska has led to many narrow wooded strips being taken out to enable the system to cross small intermittent streams.

The decline in riparian forested zones across the Great Plains has attracted the attention of several natural resource-related agencies and groups. For example, the Forestry Committee of the Great Plains Agricultural Council, in response to the decline of this vital resource, assembled the Great Plains Riparian Forest Management Task Force in 1993. Their publication, *Riparian Forest Management in the Great Plains*, is an excellent primer on the challenges that the Great Plains faces concerning riparian forests (Great Plains Agricultural Council 1993).

Sediment is the major cause of non-point water pollution in the United States (Welsch 1991). In Nebraska, the risk of high rates of sediment production from most forest land is low due to the relatively flat landscape, the holding capacity of the organic matter and root systems, and the growing use of Best Management Practices (BMP) in forestry operations. BMP's are practical procedures designed to reduce pollution from non-point sources and involve streamside management and water

control (U.S. Department of Agriculture, Forest Service 1989). BMP's are ways to build roads, harvest timber, and do other forest operations, while keeping streams and lakes clean. In some areas, such as in the Pine Ridge, steep terrain and erodible soils create situations where the potential is higher for sedimentation to occur, but these sites are local in nature and not of widespread concern. Potential sedimentation rate is a primary factor in determining proper BMP for forest management activities. Foresters in Nebraska have developed a series of forest water quality BMP that prescribe practices to reduce the likelihood of impacts resulting from forest management (Nebraska Forest Service 1997). As increasing numbers of landowners volunteer to include BMP recommendations in their forestry operations, rates of sedimentation from forest land should steadily decline. The 1997 *Forestry Best Management Practices for Nebraska* (Nebraska Forest Service 1997) is an excellent reference for both landowners and professional natural resource managers. If the practices and principles recommended in this publication are followed, the water quality in Nebraska will be improved and protected.

Harvesting operations have the greatest potential for impacts on water quality due to their potential impact on sedimentation and nutrient loading in the water system. Timber harvests accomplished with BMP's will have significantly fewer water resource impacts than timber harvests in the absence of BMP's (Perry *et al.* 1992).

Nebraska's forest land area expanded by 229 thousand acres between 1983 and 1994. This expansion occurred as nonforest lands such as cropland and pasture were converted naturally to trees. If the expansion of forest land area continues, the positive water quality benefits associated with forests will increase. The quality of Nebraska's water in the future will mirror the area, health, and vigor of its forest.

Soil Erosion Protection

Soils are the fundamental resource on which rests the ability of land to provide a wide array of benefits. Humankind and wildlife rely on soils as the basic source for the production of life-sustaining food and shelter. The long-term productivity of our soil resource is of primary concern for everyone. Erosion reduces soil

fertility, has off-site impacts, and reduces the economic value of land. For forestry and agriculture, maintenance of site productivity is key to sustainable management.

Forests protect the soil both directly and indirectly from wind and water erosion. Wind erosion rarely occurs in wooded areas due to the forest canopy, strong soil support provided by tree roots, and mulch on the forest floor. In addition to the protection provided by forests, other treed areas such as windbreaks, wooded strips, wooded pastures, and croplands with trees protect the soil from wind erosion. Windbreaks lower soil erosion by slowing down the wind as it passes over a field. Natural stands of wooded strips are often found adjacent to croplands and help to protect soil from wind erosion (fig. 27). Other factors such as the quantity of crop residue present and field size also impact wind erosion. In 1994, Nebraska had more than 179 thousand acres of wooded strips, many of which were windbreaks. The benefits of windbreaks extend leeward for a distance of at least 10 times the height of the trees (Wardle and Schmidt 1984). Thus, Nebraska's windbreaks protect hundreds of thousands of acres of cropland.

Wooded strips along drainages in riparian zones are some of the most valuable in the



Figure 27.—This narrow strip of native woody vegetation provides wind erosion protection similar to an established windbreak. In addition, these trees also provide travel corridors for wildlife; a source of wood fiber for firewood, saw logs, and other products; and many other benefits.

State in terms of protection from soil loss. Soils along drainages are easily eroded when the land-use changes from forested to other uses such as croplands or pasture. Soil erosion on these areas not only degrades the specific site, but can also cause other off-site damages downstream.

Forest land generally has a low rate of sheet and rill erosion. On undisturbed well-managed forest land in the Eastern United States, the soil experiences an average erosion rate of 0.05 to 0.1 ton per acre per year (Patric 1976). However, due to the high level of organic matter contributed annually by leaf drop and fallen limbs, branches, and boles, healthy forest ecosystems create soil rather than lose soil. This increase in soil from a forest increases the future potential productivity of the site.

Off-site impacts from soil erosion include losses of water-oriented recreational values because of turbid waters in streams, rivers, and lakes; costs of dredging to maintain channels in navigable waters such as the Missouri River; and increased costs from flooding where sedimentation has lessened the channel capacity of riverbeds. Forest lands, especially those in the riparian zone, can lessen the off-site impacts from soil erosion.

Forest soils can suffer nutrient loss, soil compaction, and soil erosion due to timber harvesting (Grigal and Bates 1992). These problems can be mitigated through proper timing and techniques such as retaining as much organic material as possible on the site, harvesting during winter and dry periods, and being aware of the soil type and its susceptibility to compaction and erosion. In general, care must be taken or timber harvesting and other forest management activities can lead to erosion rates greater than the soil loss tolerance value as established by the Natural Resources Conservation Service's Universal Soil Loss Equation in some skid trails and haul roads (Grigal and Bates 1992).

The environmental benefits received from the forest resource concerning soil protection are of utmost importance and value. As forestry proceeds into the 21st century in Nebraska, the impact of forestry activities on the soil resource will be a primary consideration.

Visual Diversity and Aesthetics

Nebraska is famous for its agricultural production; croplands, pastures, and rangeland dominate the landscape. Although forests occupy a small percentage of the landscape, trees provide diversity and, in combination with the other land-uses, create a mosaic that is visually attractive. Contributing to the visual mosaic in Nebraska is the diversity of the forest. Ten different forest types were identified in the 1994 inventory. This variety in Nebraska's forests is due to the State having prairie-related forests such as elm-ash-cottonwood, Rocky Mountain type forests of ponderosa pine, and central hardwood forests such as oak-hickory.

Timber harvests and other forest management practices can impact the visual quality of the State's forests. The intensity of harvest, amount of slash, and time since harvest are factors that influence scenic quality. Generally, smaller operations with reduced slash have fewer scenic impacts (Schroeder *et al.* 1993).

WHAT IS THE FUTURE FOR NEBRASKA'S FOREST RESOURCES

Nebraska has many opportunities for improving the current status and condition of its forests, which will bring improved environmental and economic benefits. The opportunities presented in this publication are only highlights; for in-depth discussions, contact the State Forester's Office.

Projections of Nebraska's Future Timber Supply

We made two sets of 15-year projections of Nebraska's future supply of timber to gain an understanding of the possible outlook for the State's forests. One of the projections assumes that growth and removals will follow the same trend established between the 1983 and 1994 inventories (consistent scenario). This projection assumes levels of management and investment consistent with that experienced between the most recent inventories. The other projection assumes an accelerated level of growth and slightly increased management (accelerated scenario). In both scenarios, average annual growth and removals were used instead of current figures because the

average annual figure is a better measure of trends over time. Assumptions used in making the projections were:

1. In both projections, the area of timberland is estimated to increase, but at a slower rate than in the recent past. Between 1983 and 1994, the area of timberland increased at an annual rate of 2.7 percent. For this projection, it is estimated that in the next 15 years, Nebraska will increase its area of timberland by 1.0 percent per year. Based on this percent increase, the total area of timberland will increase from 898.4 thousand acres in 1994 to 1,053 thousand acres in 2009. The stocking levels on these new areas will be lower than on existing timberland areas. It is estimated that the new areas of timberland will average 300 cubic feet per acre. This is based on the assumption that the newly classified timberland areas will come predominately from areas that had trees present in the most recent inventory but not to the level necessary to qualify as timberland.
2. The availability of timberland for harvest will remain the same as in the recent past.
3. For the consistent scenario, growth rates will remain constant at the 1993 level throughout the projection period, 1.7 percent of growing-stock inventory. For the accelerated scenario, growth rates will increase on a straight line from 1.7 percent in 1993 to 2.45 percent in 2009 (an increase in the average annual growth of 0.05 percent per year).
4. For the consistent scenario, removals will remain constant at the average annual rate established between 1983 and 1993 (0.8 percent of growing-stock inventory). For the accelerated scenario, removals from growing stock will increase at 0.05 percent per year.
5. There will be no change in the economic, social, or political structure.

Consistent Scenario Projection

In this projection, total growing-stock volume rises from 854 million cubic feet in 1994 to 980 million cubic feet in 2009, average annual growth rises from 14.3 million cubic feet in

1993 to 16.5 million cubic feet in 2009, and removals rise from 6.6 million cubic feet in 1993 to 7.8 million cubic feet in 2009 (fig. 28).

With this scenario, the difference between growth and removals increases from about 7.6 million cubic feet per year in 1994 to 8.7 million cubic feet per year in 2009. This difference will allow for consideration of a slight increase in the rate of removals.

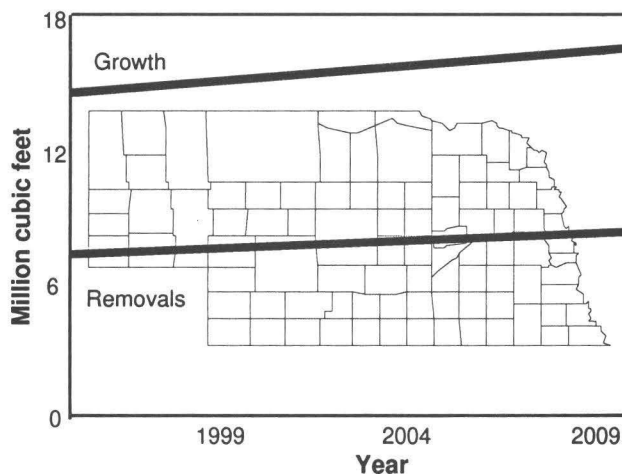


Figure 28.—Projected growth and removals for the consistent future scenario for Nebraska.

Accelerated Management Scenario

In the accelerated projection, total growing-stock volume rises from 854 million cubic feet in 1994 to 1.0 billion cubic feet in 2009, average annual growth rises from 14.3 million cubic feet in 1993 to 24.8 million cubic feet in 2009, and removals rise from 6.6 million cubic feet in 1993 to 8.3 million cubic feet in 2009 (fig. 29).

With the accelerated management scenario, the difference between growth and removals increases from about 7.6 million cubic feet per year in 1994 to 16.5 million cubic feet per year in 2009. This difference will allow for consideration of a greatly increased rate of removals. The accelerated management scenario will provide about 8 million cubic feet of additional growing stock per year compared to the consistent management option.

With the current average market values for sawtimber being at least \$20 per thousand board feet (1,000 board feet equals about 200 cubic feet), this additional 8 million cubic feet

has the potential for an increase in market value of \$800,000 per year as income to landowners for standing timber.

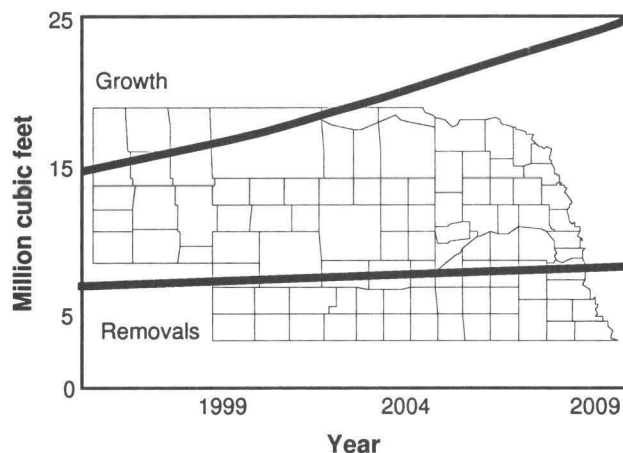


Figure 29.—Projected growth and removals for the accelerated management future scenario for Nebraska.

These increases are based on minimal increases in management activity. If the level of investment in Nebraska's forests increases beyond those projected, the level of return in the form of improved health and vigor of the timberlands and increased growing-stock volume available for harvest will correspondingly increase. Several factors could result in increased total volume, growth, and resulting potential removals: the area of timberland could easily surpass the projected level based on recent history; average stand-size class will probably increase as the forests mature (and as a result, their diameters will increase); and stocking will probably improve, especially on those newly established forests. If these factors occur, growing-stock volume on Nebraska's timberlands will increase at an even faster rate.

The intensive application of forest management techniques such as the selection of harvest trees by professional foresters, tree planting, and timber stand improvement (TSI) practices could result in higher growth rates and larger inventories than those projected. In addition, inventories can be extended by increased use of wood residues, and tree tops and limbs (these volumes are not included in growing-stock inventories). Greater use of the non-growing-stock volumes found in short-log trees, other rough trees, and rotten trees will also stretch inventories.

Forest Management Opportunities

Improving the stocking on the existing timberlands in Nebraska will conceivably provide for the greatest return. This will not require any additional acres but has the potential to greatly increase the total growing-stock volume in the State. Many activities could improve the stocking rate in Nebraska, but perhaps the two most effective activities would be to lower the area of timberland in eastern Nebraska grazed by livestock, and to place a greater percentage of timberland under management. Currently, it is estimated that less than 10 percent of the timberland in Nebraska is managed with input from a professional forester. Increasing this percentage has the potential to greatly improve stocking as well as to improve the long-term viability of the stand.

Tree Planting Opportunities

Tree planting opportunities abound in Nebraska in both urban and rural settings. The number of street and park trees annually planted in Nebraska could be doubled, and the number of rural tree plantings could be tripled.

Currently, about 2 million seedlings are planted annually in Nebraska for conservation purposes. It has been estimated that at least 6 million seedling trees are needed just for conservation purposes. Several sources cite the need to dramatically increase the number of trees annually planted in Nebraska (Wardle and Schmidt 1984, Schmidt and Wardle 1986,

Hergenrader 1993, Brandle *et al.* 1992). While most tree plantings provide multiple benefits, some of the greatest needs for additional tree plantings in Nebraska are for cropland windbreaks, livestock protection, and water quality protection. The expansion of native timberlands helps but typically does not occur in the specific locations where conservation trees are needed.

In addition, thousands of seedling trees could be planted to re-establish forest in areas that have been cleared but where the most appropriate use might be forestry. As previously mentioned, many of the new forested areas are located on sites that do not have potential productivities similar to the forested lands that were previously cleared. Lands that were cleared of forests typically are highly productive sites with the potential to provide favorable rates of return on investments and additional environmental benefits.

The use of Nebraska's forests, like the use of forests around the country, is coming under closer scrutiny from the public. Clean water, soil protection, wildlife habitat, recreation, esthetic beauty, biodiversity, and commodity products are important now but will be increasingly important in the future. The mix of products we choose will significantly impact the way forest lands are managed in the years ahead. Decisions about the future of this valuable resource must be made with the best available information and with the interests of all Nebraskans in mind.

APPENDIX

RELIABILITY OF THE SURVEY

Forest Inventory and Analysis information is based on a sampling procedure designed to provide reliable statistics at the State level. Consequently, the reported figures are estimates only. A measure of reliability of these figures is given by sampling errors (see tabulation below). These sampling errors mean that the chances are two out of three that if a 100-percent inventory had been made, using the same methods, the results would have been within the limits indicated.

For example, the estimated growing-stock volume in Nebraska in 1994, 854.4 million cubic feet, has a sampling error of ± 6.1 percent (± 52.1 million cubic feet). The growing-stock volume from a 100-percent inventory would be expected to fall between 802.3 million cubic feet and 906.5 million cubic feet (854.4 ± 52.1), there being a one in three chance that this is not the case.

Item	State totals	Sampling error
Growing stock	<i>Million cubic feet</i>	<i>Percent</i>
Volume (1994)	854.4	6.1
Average annual growth (1982-1993)	14.5	8.9
Average annual removals (1982-1993)	6.9	24.7
Sawtimber	<i>Million board feet</i>	
Volume (1994)	3,360.1	7.2
Average annual growth (1982-1993)	65.3	10.2
Average annual removals (1982-1993)	21.8	21.4
Area	<i>Thousand acres</i>	
Timberland (1996)	898.4	4.8

As survey data are broken down into sections smaller than State totals, the sampling error increases. For example, the sampling error for timberland area in a particular Natural Resources District is higher than that for total timberland area in the State. To estimate sampling error for

data smaller than State totals, use the following formula:

$$E = \frac{(SE) \sqrt{(\text{State total volume or area})}}{\sqrt{(\text{Volume or area smaller than State total})}}$$

Where :

E = Sampling error in percent.

SE = State total error for volume or area.

For example, to compute the error on the area of timberland in the elm-ash-locust type for the State, proceed as follows:

- 1) Total statewide area of elm-ash-locust type = 234.0 thousand acres.
- 2) Total statewide area of all timberland = 898.4 thousand acres.
- 3) The State total error for timberland area = 4.8 percent.
- 4) Using the above formula:

$$E = \frac{0.048 \sqrt{898.4}}{\sqrt{234.0}}$$

E = 9.4 percent sampling error for the elm-ash-locust forest type in Nebraska. Sampling errors for area, volume, growth, and removals, for both growing stock and sawtimber, for each Natural Resources District in Nebraska, are shown in table 56.

COMPARING THE THIRD INVENTORY OF NEBRASKA WITH THE SECOND INVENTORY

A new volume estimation procedure developed for the Central States was used to compute the 1994 volumes and to recompute the 1983 volume. Although the adjustment will differ by species, the recomputed 1983 growing-stock and sawtimber volumes will generally be greater than those shown in the 1983 report.

Past surveys used only growing-stock trees to determine stand-size class. Current survey procedures require that stand-size

class be determined on the basis of all live trees. Therefore, direct comparisons of current inventory data to old inventory data by stand-size class may be misleading.

SURVEY PROCEDURES

The survey procedures used in this inventory are described in detail in Hansen, 1998. A summary of these procedures is presented here. This summary consists of three parts:

- 1) A description of the statistical design used in the inventory, which deals with the methods used for stratification, aerial photo, and ground plot selection and estimation.
- 2) A description of the ground plot measurements that focuses on the plot design and changes in the design between the 1983 and 1994 inventories.
- 3) A description of the methods used to compute items presented in this report (area, number of trees, volume, growth, mortality, removals, and biomass) from field plot measurements.

STATISTICAL DESIGN

The basic design for this inventory consists of two independent samples that were combined to provide an overall estimate of the forest resources of Nebraska. The first sample is based on the remeasurement of the 1983 NCFIA inventory, and the second sample is based on the Natural Resources Conservation Service's Natural Resources Inventory (NRCS-NRI). These samples produced two independent estimates of the total forest resource in Nebraska and were combined, using statistically appropriate methods, to provide the best overall estimates possible.

SAMPLE BASED ON THE REMEASUREMENT OF THE 1983 NCFIA INVENTORY

The first sample was based on the remeasurement of aerial photo and ground plots taken during the 1983 NCFIA inventory of Nebraska. This inventory used double (two phase) sampling for stratification as presented in various texts on sampling such as Cochran (1977) and Loetsch and Haller (1964). Aerial

photo plots were observed in the first phase, and ground measurement or field plots were measured in the second phase.

1983 NCFIA Inventory Aerial Photo Plots (Phase 1)

The first phase of the 1983 inventory was a systematic sample of aerial photo plots distributed over the entire State. Sampling was completed using a grid at the intensity of 121 photo plots per township (6 miles by 6 miles). This provided a phase 1 sampling rate of one photo plot per 190.4 acres. Each photo sample plot was classified as *forest*, *nonforest with trees*, *nonforest without trees*, *questionable* (samples where the photo interpreter was unable to make a definite call between forest and nonforest), *unproductive*, *census water*, or *noncensus water*. The distribution of photo plots by aerial photo classification in the 1983 NCFIA forest inventory was:

Forest	5,731
Questionable	70
Unproductive	7
Nonforest with trees	5,409
Nonforest without trees	247,504
Noncensus water	230
<u>Census water</u>	<u>1,551</u>
Total	260,502

1983 NCFIA Inventory Ground Plots (Phase 2)

A systematic sample of the aerial photo plots was selected as ground plots in phase 2 of the 1983 inventory. A total of 14,438 ground plots were selected from the 260,502 photo plots. These ground plot locations were carefully examined stereoscopically, pin pricked on the aerial photo, and assigned a ground plot identification number. Ground plots that definitely were not forest land (those classified as nonforest without trees, noncensus water, or census water) were given a nonforest ground land use classification (more detailed than the photo classification done on all photo plots) by the photo interpreter and not sent to the field for measurement. These plots are referred to as office ground plots. Ground plot locations that could possibly be forest land (those classified as forest, questionable, unproductive, or nonforest with trees) were sent to the field for ground classification. The average ground plot sampling intensity was

one ground plot per 3,398 acres. The distribution of ground plots by aerial photo classification in the 1983 NCFIA inventory was:

Forest	306
Questionable	3
Unproductive	3
Nonforest with trees	263
Nonforest without trees	13,763
Noncensus water	10
<u>Census water</u>	<u>90</u>
Total	14,438

Estimates of the forest resources presented in 1983 inventory reports are based on double sampling for stratification based on these seven strata.

Remeasurement of the 1983 NCFIA Inventory

The aerial photo classification completed in the 1983 inventory was used for stratification in the first sample of the 1994 Nebraska forest resources inventory. These 260,502 photo plots were used as the phase 1 sample to estimate the area in each of the seven strata. The second phase used plots that were visited by field crews to sample and observe ground conditions (land-use, volume, growth, mortality, removals, etc.) within the seven strata.

The 1983 ground plots measured in the field form the second phase of this sample. In the forest, nonforest with trees, questionable, and unproductive strata, remeasurement observations of every systematic ground plot locations established during the 1983 inventory were used to estimate average ground conditions within each strata in 1994. In the nonforest without trees, census water, and noncensus water strata, a cluster sampling scheme (using townships as clusters) was used to make repeated ground observations of the photo plots established in the 1983 inventory.

This sampling scheme was selected to improve our ability to estimate the area of forest, with particular emphasis on estimating the actual area of land change to and from forest. Because all stratification was based on the same photo classification used in the previous inventory, estimates of change in forest area cannot be biased by differences in the quality of the aerial photography, the equipment and techniques used, and the individual photo interpreters and their skills. This design maintained the same level of intensity as the

previous inventory in the strata where we found most of the forest land in the 1983 inventory (the forest and questionable strata) and in those strata where we anticipated most of the additional forest land would come from (the nonforest with trees and unproductive strata). The photo plots that were classified as nonforest without trees, census water, and noncensus water in the 1983 inventory were, by far, the largest portion of the 1983 photo sample. In addition, on a plot by plot basis, these strata were anticipated to have a low probability of currently being forest. Cluster sampling provided an efficient sample of this large area with a low probability of change, by examining a large number of locations at two points in time.

In the forest, questionable, unproductive, and nonforest with trees strata where double sampling was used, the ground plot sampling intensity was one plot per 5,573 acres. In the nonforest without trees, noncensus water, and census water strata where cluster sampling was used, the State was divided into two regions along county boundaries. These two regions were sampled at different intensities. In the eastern region of Nebraska, which contains most of the forest land, a sample of 51 townships from the total of 869 townships in the region were sampled. The ground plot intensity in this region for the nonforest without tree strata was 7,187 acres per plot. In the western region of Nebraska, which contains a smaller percentage of the State's forest land, a sample of 54 townships from the total of 1,536 townships in the region were sampled. The ground plot intensity in this region for the nonforest without tree strata was 10,723 acres per plot.

Every ground plot in the 1994 inventory was classified for disturbance and other changes that may have taken place between 1983 and 1994. Disturbed plots are those plots that showed evidence of harvesting, insect or disease damage, land-use change, or other significant changes since the last inventory. A subset of the undisturbed forest ground plots were not remeasured. Instead, these plots were updated using the Stand and Tree Evaluation Modeling System (STEMS) (Belcher *et al.* 1982). The undisturbed forest plots that were remeasured were used to adjust the STEMS model for discrepancies between updated and actual remeasurements using methods presented in Hansen (1990) that have been used

in the previous NCFIA inventories in Michigan, Minnesota, Iowa, Missouri, and Wisconsin. The undisturbed forest plots that were not remeasured are referred to as pseudo-remeasurement plots because they contain all the data normally collected on a remeasurement plot (new plot and tree level data) but without the expense of a field visit. This methodology has been very efficient in other States inventoried by NCFIA. Not remeasuring these undisturbed forest plots made available the resources needed to establish additional ground plots for the second inventory based on the NRCS-NRI.

SAMPLE BASED ON THE NRCS-NRI

Just before this inventory, the Natural Resources Conservation Service (NRCS) conducted its National Resources Inventory (NRI) in the Plains States (U.S. Department of Agriculture 1991) using a two-stage sampling design. This sample design consisted of 160-acre and 640-acre primary sampling units (PSU) with three 2-acre secondary sampling units (SSU) located within the PSU's. The NRCS-NRI inventory sampled all lands except those owned by the Federal government. Estimates of the 1994 forest resources on Federal lands (primarily Forest Service, Corps of Engineers, and Bureau of Indian Affairs lands) come entirely from the NCFIA inventory described in the previous section. The data collected in the NRI formed the basis for stratification of the second independent inventory.

This second portion of the overall inventory of Nebraska's forest resources used the NRCS-NRI area estimates and point data as its basis for stratification and ground plot location in a double sampling scheme similar to the first portion of the inventory (the NCFIA remeasurement of the 1983 field ground plots). The number of 2-acre SSU plots that were sampled by NRCS in the Nebraska NRI were:

Forest (20 percent tree cover or greater)	3,773
Nonforest (less than 20 percent tree cover)	253,854
Total	257,627

NCFIA photo classified and installed standard NCFIA field ground plots on a subset of the NRI-SSU plot locations. The selection criteria used selected a random sample of 5 percent of all PSU's and established plots at all three SSU

points within this 5 percent sample. In addition any SSU having 20 percent or greater tree cover was also included in the NCFIA sample. This subsampling of the NRI (5 percent of the less than 20 percent tree cover and 100 percent of the 20 percent or more tree cover) formed the basis of the estimation of means within strata. The average sampling intensity was one ground plot per 6,422 acres in the forest stratum and one ground plot per 54,158 acres in the nonforest stratum.

COMBINED ESTIMATE BASED ON THE TWO INDEPENDENT INVENTORIES

These two inventories produced two independent estimates of the forest resources in Nebraska. Final estimates presented in this report are based on weighted averages from these two independent estimates. Weighting was proportional to the number of ground plots on forest land for the estimates of most items including area, number of trees, volume, growth, mortality, and biomass. Weighting based on the number of remeasurement plots on forest land was used for estimates of items that can only be obtained from remeasurement plots, including removals and area change over time.

Field Measurements: 1983 Inventory Plot Design

On plots classified as timberland, wooded pasture, or windbreak (at least 120 feet wide), a ground plot was established, remeasured, or the growth and mortality of its trees were predicted using the STEMS models. Old plots selected for remeasurement that could not be relocated were replaced with new plots at the approximate locations of the old plots. Each ground plot consisted of a cluster of 10 subplots collectively covering approximately 1 acre. Trees 5.0 inches or greater in d.b.h. were sampled using 37.5 basal area factor (BAF) variable-radius plots, and trees less than 5.0 inches d.b.h. were sampled on 6.8-foot radius (1/300th acre) micro-plots established at the centers of subplots 1, 2, and 3. Under the estimation procedures used for this inventory, an entire plot was represented by a single condition class where condition was determined by forest type, stand size class, land use, stand origin, and density. Thus, the arrangement of the 10 subplots within the plot was adjusted if any subplots were located in condition classes different from that of subplot

1. In particular, if a subplot was located outside the condition class for the plot, it was re-established or rotated into the condition class used for the entire plot. For example, if subplots 1 through 9 were located in forest land, and subplot 10 was located in a pasture, then subplot 10 was rotated back into the forest land condition class.

Field Measurements: 1994 Inventory Plot Design

Field ground plots were established, remeasured, or the growth and mortality of their trees were predicted using the STEMS models for all forest lands (including reserved forest land, unproductive forest land, and timberland), wooded pasture, or windbreaks (at least 120 feet wide). Establishing ground plots on all forest lands represented a major change between the 1983 and 1994 inventories.

In 1994, the overall plot layout consisted of 10 subplots arranged in a cluster with 70 feet between subplots. The basic locations of plots and subplots was the same as in the 1983 plot layout. All trees less than 5 inches in d.b.h. were measured on 6.8-foot radius (1/300th acre) micro-plots established at the centers of all 10 subplots. (In 1983, these micro-plots were measured only on subplots 1, 2, and 3). This radius was the maximum distance at which a 5.0-inch-d.b.h. tree would be selected using a basal area factor (BAF) of 37.5. Trees with diameters between 5.0 and 17.0 inches were selected for measurement at each of the 10 subplots with a BAF of 37.5. All trees greater than 17.0 inches d.b.h. located within a 24-foot radius macro-plot centered at each of the 10 subplots were selected for measurement.

In 1994, subplots of the same plot were not rotated, even if they were located in multiple condition classes or straddled condition classes. As in 1983, factors determining condition class were forest type, stand-size class, land-use, stand origin, and density. Plots with multiple condition classes were mapped in the field to record how the boundaries between classes split the plot. This procedure identified the area of the plot located in each class and assigned each tree to a specific class. When multiple condition classes occurred on a plot, all information normally collected for the plot as a whole, such

as forest type, site index, stand age, and stand-size class, was collected for each condition class.

On remeasured plots, the rotated subplots and all trees measured from the 1983 plot design were also remeasured in 1994 to obtain change data such as growth and mortality. On new plots, subplots were not rotated.

New Inventory Plots

New ground plots were selected from the plots identified in NCFIA's evaluation of the NRCS-NRI inventory. These new ground plots were established, and measures of current classification such as land-use, forest type, and ownership, as well as size and condition of all trees on the plot, were recorded. These locations were monumented for future remeasurement.

Old Inventory Plots

Old inventory plots are those plots established, monumented, and measured as part of the 1983 field inventory. The procedures for these old plots were different from those for new plots. Old plots were classified as "disturbed" on the basis of aerial photo analyses if either: (1) a reduction in vegetation on the plot occurred between inventories that resulted in a detectable change in the structure or function of the plant community; or (2) conditions on the plot were such that the STEMS models were unable to accurately predict growth or mortality. Plots not predicted to be disturbed were classified as "undisturbed." All disturbed plots and a one-third sample of the undisturbed plots were field remeasured to obtain estimates of current conditions and changes since the last inventory. All remaining live trees measured on these plots in 1983 were remeasured and all new trees were identified and measured.

About two-thirds of the sample plots that were in timberland at the time of the 1983 inventory and predicted to be undisturbed until this inventory were not remeasured. Growth and mortality for these plots were predicted using the STEMS models as a means of obtaining growth and current volume. A comparison of the predicted growth and mortality for these undisturbed plots and observations for growth and mortality for the one-third sample of remeasured undisturbed plots was used to

adjust the model predictions to accommodate local conditions. The adjustment procedure is a modified version of the method described by Smith (1983).

The undisturbed timberland plots whose growth and mortality were predicted were treated in the estimation process as measured ground plots, even though they were not visited by field crews. The plot records for these plots were sent to the field for verification of current ownership information. All old plots classified as disturbed were selected for remeasurement to assess and verify changes since the last inventory. Table D summarizes the distribution of all ground plots for the 1994 Nebraska inventory by type and plot.

COMPUTATION OF ESTIMATES: AREA

All area estimates were made using two-phase estimation methods. In this type of estimation, a preliminary estimate of area by land-use is obtained from stratification (Phase 1) and corrected by plot measurements (Phase 2). A complete description of these methods are presented by Loetsch and Haller (1964).

COMPUTATION OF ESTIMATES: VOLUME

Estimates of volume per acre were made from the measurements and predictions for trees on each of the 10 subplots per plot. For each condition class on a plot, the volume per acre estimate was multiplied by the area estimate

represented by the condition, and these products were summed over all plots to obtain estimates of total volume for the condition class. Net cubic and board foot volumes are based on tree measurements (d.b.h., tree class, and site index) and volume equations presented by Hahn and Hansen (1984).

COMPUTATION OF ESTIMATES: GROWTH AND MORTALITY

On remeasured plots, estimates of growth and mortality per acre were derived from remeasurements and observations of trees that died between inventories. These estimates were based on the remeasurement of the 1983 inventory plots using the 1983 plot design. Growth, reported as average annual net growth between the 1983 and 1994 inventories, was computed from data for both plots that had been remeasured and plots whose growth and mortality had been predicted using methods presented by Van Deusen *et al.* (1986). Average annual mortality was also calculated for the remeasurement period.

On new plots, estimates of growth and mortality were obtained by using the STEMS models to predict growth and mortality for 1 year. Current diameter and living tree estimates for old undisturbed plots were predicted using growth and mortality predictions and were derived in the same manner as for remeasured plots. Predictions of growth and mortality using the STEMS models were adjusted for

Table D.—Distribution of ground plots by ground land-use class and type of plot, 1994 inventory of Nebraska's forest resources

	Sample base ¹			Total plots
	1983 NCFIA Remeasurement		NRCS-NRI	
	Remeasured	Updated	New	
Timberland	231	38	162	431
Reserved forest land	11	0	3	14
Other forest land	5	2	2	9
Nonforest with trees	299	2	53	354
Nonforest without trees	5,084	0	888	5,972
Water	33	0	4	37
Total	5,663	42	1,112	6,817

¹ Plots that straddle more than one land-use are included in this table in the first land-use class that occurs on this list. For example, a plot that straddled other forest land and water would be included in this table as other forest land.

each survey unit (eastern and western Nebraska) to accommodate local conditions using data from the undisturbed remeasured plots. As with volume, total growth and mortality estimates were obtained by multiplying the plot-level per acre estimates by area expansion factors and then summing over plots. Current annual net growth for 1994 was computed using adjusted, 1-year STEMS predictions of growth for all inventory plots.

COMPUTATION OF ESTIMATES: AVERAGE ANNUAL REMOVALS

Average annual growing-stock and sawtimber removals (1982-1993) were estimated only from the remeasured plots. These estimates were based on the remeasurement of the 1983 inventory plots using the 1983 plot design. Measurements for new plots and predictions from the STEMS models were not used to estimate removals. These estimates were obtained from trees measured in the last inventory and either cut or otherwise removed from the timberland base. Because remeasurement plots constitute about one-half the total ground plots, and not all remeasured plots had cutting, average annual removals estimates have greater sampling errors than volume and growth estimates.

TREE AND LOG GRADES

The Forest Service reports all board foot volume in International 1/4-inch rule. In Nebraska's Pine Ridge, the Scribner log rule is commonly used. Scribner log rule conversion factors were derived from full tree measurements and an equation developed by Wiant and Castenaeda (1977). The factors (multipliers) used to convert board foot International volumes to the Scribner rule are shown in the following tabulation:

D.b.h. (inches)	Scribner rule conversion factor	
	Softwoods	Hardwoods
9.0-10.9	0.7830	—
11.0-12.9	0.8287	0.8317
13.0-14.9	0.8577	0.8611
15.0-16.9	0.8784	0.8827
17.0-18.9	0.8945	0.8999
19.0-20.9	0.9079	0.9132
21.0-22.9	0.9168	0.9239
23.0-24.9	0.9240	0.9325
25.0-26.9	0.9299	0.9396
27.0-28.9	0.9321	0.9454
29.0+	0.9357	0.9544

Log grades and tree grades were based on the classification of external characteristics as indicators of quality. Log grades or tree grades were taken on approximately one-third of the sample plots in Nebraska. All sawtimber softwood sample trees were graded for quality and assigned a butt log grade. All sawtimber hardwood sample trees were graded for quality and assigned a tree grade. The volume yield by log grade or tree grade for this sample was used to distribute the volume of the ungraded sample trees by species group.

Hardwood sawtimber trees were graded according to *Hardwood Tree Grades for Factory Lumber* (Hanks 1976). The best 12-foot section of the lowest 16-foot hardwood log was used for grading. Hardwood sawtimber trees that did not meet minimum tree grade specifications for grades 1 through 3 were assigned grade 4 according to Forest Service standard specifications for hardwood construction logs described in *A Guide to Hardwood Log Grading* (Rast *et al.* 1973).

Ponderosa pine and other softwood sawtimber trees were graded according to USDA Forest Service specifications. For all softwoods, the first merchantable 16-foot log or shorter lengths down to 12 feet were used for grading.

Hardwood Tree Grade for Factory Lumber ^a

Grade factor	Tree grade 1	Tree grade 2	Tree grade 3
Length of grading zone (feet)	Butt 16	Butt 16	Butt 16
Length of grading section ^b (feet)	Best 12	Best 12	Best 12
D.b.h., minimum (inches)	16 ^c	13	11
D.i.b., minimum at top of grading section (inches)	13 ^c 16 20	11 ^d 12	8
Clear cuttings (on the 3 best faces) ^e			
Length, minimum (feet)	7 5 3	3 3	2
Number on face (maximum)	2	2 3	Unlimited
Yield in face length (minimum)	5/6	4/6	3/6
Cull deduction (including crook and sweep, but excluding shake) maximum within grading section (percent)	9	f	50

^a Hanks (1976)

^b Whenever a 14- or 16-foot section of the butt 16-foot log is better than the best 12-foot section, the grade of the longer section will become the grade of the tree. This longer section, when used, is the basis for determining the grading factors such as diameter and cull deduction.

^c In basswood and ash, d.i.b. at top of grading section must be 12 inches and d.b.h. must be 15 inches.

^d Grade 2 trees can be 10 inches d.i.b. at top of grading section if they otherwise meet surface requirements for small grade 1's.

^e A clear cutting is a portion of a face free of defects, extending the width of the face. A face is one-fourth of the surface of the grading section as divided lengthwise.

^f Fifteen percent crook and sweep or 40 percent total cull deduction are permitted in grade 2 trees, if size and surface of grading section qualify as grade 1. If rot shortens the required clear cuttings to the extent of dropping the butt log to grade 2, do not drop the tree's grade to 3 unless the cull deduction for rot is greater than 40 percent.

**Forest Service Standard Specifications for Hardwood
Construction Logs (tie and timber logs) a, b**

Position in tree	Butts and uppers
Minimum diameter, small end	8 inches
Minimum length without trim	8 feet
Clear cuttings	No requirements
Sweep allowance	One-fourth of the diameter at the small end for each 8 feet of length.
Sound surface defects:	
Single knots	Any number, if no one knot has an average diameter above the callus in excess of one-third of the log diameter at point of occurrence.
Whorled knots	Any number, if the sum of knot diameters above the callus does not exceed one-third of the log diameter at point of occurrence.
Holes	Any number, provided none has a diameter over one-third of the log diameter at point of occurrence and none extends more than 3 inches into included timber ^c .
Unsound surface defects:	Same requirements as for sound defects if they extend into included timber. No limit if they do not.

^a Rast *et al.* (1973).

^b These specifications are minimum for the class. If, from a group of logs, factory logs are selected first, thus leaving only nonfactory logs from which to select construction logs, then the quality range of the construction logs so selected is limited, and the class may be considered a grade. If selection for construction logs is given first priority, it may be necessary to subdivide the class into grades.

^c Included timber is always square, and dimension is judged from small end.

Log Grades for Ponderosa Pine and Other Softwoods

Grade 1

1. Trees must be 16 inches in diameter or larger, grading section 12 feet in length or longer, and with deduction for defect not over 30 percent of gross scale.
2. Trees must be at least 75 percent clear on each of three faces.
3. All knots outside clear cutting must be sound and not more than 2-1/2 inches in size.

Grade 2

1. Trees must be 12 inches in diameter or larger, grading section 12 feet in length or longer, and with a net scale after deduction for defect of at least 50 percent of the gross scale deducted for defect.
2. Trees must be at least 50 percent clear on each of three faces or 75 percent clear on two faces.

Grade 3

1. Trees must be 6 inches in diameter or larger, grading section 12 feet in length or longer, and with a net scale after deduction for defect of at least 50 percent of the gross contents of the log.

Note: Diameters are diameter inside bark (d.i.b.) at small end of grading section.
Percent clear refers to percent clear in one continuous section.

METRIC EQUIVALENTS

- 1 acre = 4,046.86 square meters or 0.405 hectare.
1,000 acres = 405 hectares.
1 cubic foot = 0.0283 cubic meter.
1 foot = 30.48 centimeters or 0.3048 meter.
1 inch = 25.4 millimeters, 2.54 centimeters, or 0.0254 meter.
1 pound = 0.454 kilograms.
1 ton = 0.907 metric tons.

TREE SPECIES GROUPS IN NEBRASKA (Little 1981)

Note: Many additional tree species have been planted around homesteads and farm headquarters in rural Nebraska, in urban settings, and in tree plantings. However, only those species encountered during the third inventory of the forest resources of Nebraska are listed here. For a complete list of all of the tree species in Nebraska, please contact the Nebraska Forest Service or your local Extension Service office.

SOFTWOODS²

Rocky Mountain

- juniper *Juniperus scopulorum*
Eastern redcedar *Juniperus virginiana*
Ponderosa pine *Pinus ponderosa*
Other softwoods:

- Scotch pine *Pinus sylvestris*
Jack pine *Pinus banksiana*

HARDWOODS

- Silver maple² *Acer saccharinum*
Paper birch² *Betula papyrifera*
Select hickories¹

- Pecan *Carya illinoensis*
Shagbark hickory *Carya ovata*
Other hickories¹

- Bitternut hickory *Carya cordiformis*
Hackberry² *Celtis occidentalis*
Sugarberry² *Celtis laevigata*
Green ash¹ *Fraxinus pennsylvanica*

¹This species or species group is considered a hard hardwood, with an average specific gravity greater than or equal to 0.50.

²This species or species group is considered a soft hardwood, with an average specific gravity of less than 0.50.

Kentucky coffeetree ²	<i>Gymnocladus dioica</i>
Black walnut ¹	<i>Juglans nigra</i>
Sycamore ²	<i>Platanus occidentalis</i>
Eastern cottonwood ²	<i>Populus deltoides</i>
Black cherry ²	<i>Prunus serotina</i>
Select white oaks ¹	
Bur oak	<i>Quercus macrocarpa</i>
Chinkapin oak	<i>Quercus muehlenbergii</i>
Select red oak ¹	
Northern red oak	<i>Quercus rubra</i>
Other red oaks ¹	
Black oak	<i>Quercus velutina</i>
Black willow ²	<i>Salix nigra</i>
American basswood ²	<i>Tilia americana</i>
Elms	
American elm ²	<i>Ulmus americana</i>
Siberian elm ²	<i>Ulmus pumila</i>
Slippery elm ²	<i>Ulmus rubra</i>
Rock elm ¹	<i>Ulmus thomasi</i>
Other hardwoods	
Boxelder ²	<i>Acer negundo</i>
Northern catalpa ²	<i>Catalpa speciosa</i>
Honeylocust ¹	<i>Gleditsia triacanthos</i>
White mulberry ²	<i>Morus alba</i>
Red mulberry ²	<i>Morus rubra</i>
Black locust ¹	<i>Robinia pseudoacacia</i>
Noncommercial species	
Ailanthus	<i>Ailanthus altissima</i>
American hornbeam	<i>Carpinus caroliniana</i>
Flowering dogwood	<i>Cornus florida</i>
Hawthorn	<i>Crataegus</i> spp.
Osage-orange	<i>Maclura pomifera</i>
Apple	<i>Malus</i> spp.
Eastern hophornbeam	<i>Ostrya virginiana</i>
Wild plum	<i>Prunus</i> spp.
Chokecherry	<i>Prunus virginiana</i>
Peachleaf willow	<i>Salix amygdaloides</i>
Diamond willow	<i>Salix bebbiana</i>

DEFINITION OF TERMS

Average annual mortality of growing

stock.—The average cubic foot volume of sound wood in growing-stock trees that died in one year. Average annual mortality is the average for the years between inventories (1983 to 1993 in this report).

Average annual mortality of sawtimber.—

The average board foot volume of sound wood in sawtimber trees that died in one year. Average annual mortality is the average for the years between inventories (1983 to 1993 in this report).

Average annual removals from growing

stock.—The average net growing-stock volume in growing-stock trees removed annually for roundwood forest products, in addition to the volume of logging residues and the volume of other removals. Average annual removals of growing stock are the average for the years between inventories (1983 to 1993 in this report) and are based on information obtained from remeasurement plots (see Survey Procedures in the Appendix).

Average annual removals from sawtimber.—

The average net board foot sawtimber volume of live sawtimber trees removed annually for roundwood forest products, in addition to the volume of logging residues, and the volume of other removals. Average annual removals of sawtimber are the average for the years between inventories (1983 to 1993 in this report) and are based on information obtained from remeasurement plots (see Survey Procedures in the Appendix).

Average annual net growth of growing

stock.—The annual change in cubic foot volume of sound wood in live sawtimber and poletimber trees, and the total volume of trees entering these classes through ingrowth, less volume losses resulting from natural causes. Average net annual growing stock is the average for the years between inventories (1983 to 1993 in this report).

Average annual net growth of sawtimber.—

The annual change in the board foot volume of live sawtimber trees, and the total volume of trees reaching sawtimber size, less volume losses resulting from natural causes. Average net annual growth of sawtimber is the average for the years between inventories (1983 to 1993 in this report).

Basal area.—Tree area in square feet of the cross section at breast height of a single tree. When the basal areas of all trees in a stand are summed, the result is usually expressed as square feet of basal area per acre.

Biomass.—The aboveground volume of all live trees (including bark but excluding foliage) reported in green tons (i.e., green weight). Biomass has four components:

Bole.—Biomass of a tree from 1 foot above the ground to a 4-inch top outside bark.

Tops and limbs.—Total biomass of a tree from a 1-foot stump minus the bole.

1- to 5-inch trees.—Total aboveground biomass of a tree from 1 to 5 inches in diameter at breast height.

Stump.—Biomass of a tree 5 inches d.b.h. and larger from the ground to a height of 1 foot.

Bolts.—Roundwood logs of less than 8 feet in length that are converted into shingles, cooperage stock, dimension stock, blocks, blanks, excelsior, etc. No minimum diameter limits. Does not include logs used for the manufacture of pulp or veneer.

Commercial species.—Tree species presently or prospectively suitable for industrial wood products. (Note: Excludes species of typically small size, poor form, or inferior quality.)

Cord.—One standard cord is 128 cubic feet of stacked wood, including bark and air space. Cubic feet can be converted to solid wood standard cords by dividing by 79.

Corporate.—Lands owned by a private corporation not in the business of operating primary wood-using plants.

County and municipal land.—Land owned by counties and local public agencies or municipalities, or land leased to these governmental units for 50 years or more.

Cropland.—Land under cultivation within the last 24 months; including cropland harvested, crop failures, cultivated summer fallow, idle cropland used only for pasture, orchards, active Christmas tree plantations indicated by annual shearing, nurseries, and land in soil improvement crops, but excluding land cultivated in developing improved pasture.

Cull.—Portions of a tree that are unusable for industrial wood products because of rot, missing or dead material, form, or other defect.

Current annual net growth of growing stock.—The annual change in volume of sound wood in live sawtimber and poletimber trees, and the total volume of trees entering these classes through ingrowth, less volume losses resulting from

natural causes, reported for a single year (1993 in this report). Current growth is based on an estimate of the current annual increment of each growing-stock tree in the inventory.

Current annual net growth of sawtimber.—

The annual change in the volume of live sawtimber trees, and the total volume of trees reaching sawtimber size, less volume losses resulting from natural causes, reported for a single year (1993 in this report). Current growth is based on an estimate of the current annual increment of each growing-stock tree in the inventory.

Current annual removals from growing stock.—The current net growing-stock volume in growing-stock trees removed annually for roundwood forest products, in addition to the volume of logging residues, and the volume of other removals.

Current annual removals of growing stock are reported for a single year (1993 in this report); they are based on a survey of primary wood processing mills to determine removals for products and on information from remeasurement plots (see Survey Procedures in the Appendix) to determine removals due to land-use change.

Current annual removals from sawtimber.—

The current net board foot sawtimber volume of live sawtimber trees removed annually for roundwood forest products, in addition to the volume of logging residues, and the volume of other removals. Current annual removals of sawtimber are reported for a single year (1993 in this report); they are based on a survey of primary wood processing mills to determine removals for products and on information from remeasurement plots (see Survey Procedures in the Appendix) to determine removals due to land-use change.

Diameter class.—A classification of trees based on diameter outside bark, measured at breast height 4.5 feet above the ground. (Note: d.b.h. is the common abbreviation for diameter at breast height.) Two-inch diameter classes are commonly used in Forest Inventory and Analysis, with the even inch the approximate midpoint for a class. For example, the 6-inch class includes trees 5.0 through 6.9 inches d.b.h.

Diameter at breast height (d.b.h.).—The outside bark diameter at 4.5 feet (1.37 m) above the forest floor on the uphill side of the tree. For determining breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

Forest industry land.—Land owned by companies or individuals operating primary wood-using plants.

Forest land.—Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use. (Note: Stocking is measured by comparing specified standards with basal area and/or number of trees, age or size, and spacing.) The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails, streams, or other bodies of water or clearings in forest areas shall be classed as forest if less than 120 feet wide. (See Tree, Land, Timberland, Reserved forest land, Other forest land, Stocking, and Water.)

Forest type.—A classification of forest land based on the species forming a plurality of live tree stocking. The associated species for each forest type are based on net volume of growing stock and all live biomass by species group and forest type from the 1994 inventory of Nebraska forests. Major forest types in Nebraska are:

Ponderosa pine.—Forests in which ponderosa pine comprises a plurality of the forest stocking.

Eastern redcedar.—Forests in which eastern redcedar comprises a plurality of the forest stocking. Species commonly associated with the eastern redcedar forest type in Nebraska include cottonwood and elm.

Eastern redcedar-hardwoods.—Forests in which hardwoods comprise a plurality of the forest stocking but in which eastern redcedar comprises between 25 and 50 percent of the forest stocking. Hardwood species commonly associated with the hardwood portion of this forest type in Nebraska include cottonwood, elm, bur oak, green ash, hackberry, and black walnut.

Bur oak.—Forests in which bur oak comprises a plurality of the forest stocking. Species commonly associated with the bur oak forest type in Nebraska include eastern redcedar, hackberry, and green ash.

Cottonwood.—Lowland forests in which cottonwood comprises a plurality of the forest stocking. Species commonly associated with the cottonwood forest type in Nebraska include silver maple, boxelder, eastern redcedar, mulberry, and green ash.

Willow.—Lowland forests in which black willow comprises a plurality of the forest stocking. Species commonly associated with the willow forest type in Nebraska include cottonwood and boxelder.

Oak-hickory.—Forests in which northern red oak, bur oak, chinkapin oak, black oak, or hickories, singly or in combination, comprise a plurality of the forest stocking. Species commonly associated with the oak-hickory forest type in Nebraska include hackberry, elm, green ash, cottonwood, and basswood.

Elm-ash-cottonwood.—Lowland forests in which elm, green ash, cottonwood, and silver maple, singly or in combination, comprise a plurality of the forest stocking. Species commonly associated with the elm-ash-cottonwood forest type in Nebraska include hackberry, green ash, boxelder, and black willow.

Maple-basswood.—Forests in which elm, basswood, black walnut, green ash, and hackberry, singly or in combination, comprise a plurality of the forest stocking. Species commonly associated with the maple-basswood forest type in Nebraska include black cherry, honeylocust, Kentucky coffeetree, sycamore, and oaks.

Elm-ash-locust.—Upland forests in which elm, green ash, honeylocust, black locust, and hackberry comprise a plurality of the forest stocking. Species commonly associated with the elm-ash-locust forest type in Nebraska include bur oak, eastern redcedar, black walnut, and paper birch.

Growing-stock tree.—A live tree of commercial species that meets specified standards of size, quality, and merchantability. (Note: Excludes rough, rotten, and dead trees.)

Growing-stock volume.—Net volume in cubic feet of growing-stock trees 5.0 inches d.b.h. and over, from 1 foot above the ground to a

minimum 4.0-inch top diameter outside bark of the central stem or to the point where the central stem breaks into limbs.

Hard hardwoods.—Hardwood species with an average specific gravity greater than 0.50 such as oaks, hard maple, hickories, and ash.

Hardwoods.—Dicotyledonous trees, usually broad-leaved and deciduous. (See Soft hardwoods and Hard hardwoods.)

Improved pasture.—Land currently improved for grazing by cultivating, seeding, irrigating, or clearing trees or brush and less than 10 percent stocked with trees.

Indian land.—Land held in trust by the United States for tribes or individual Indians.

Industrial wood.—All roundwood products except residential fuelwood.

Land.—(a) *Bureau of the Census.* Dry land and land temporarily or partly covered by water such as marshes, swamps, and river flood plains (omitting tidal flats below mean high tide); streams, sloughs, estuaries, and canals less than one-eighth of a statute mile wide; and lakes, reservoirs, and ponds less than 40 acres in area.

(b) *Forest Inventory and Analysis.* The same as the Bureau of the Census, except minimum width of streams, etc., is 120 feet and minimum size of lakes, etc., is 1 acre.

Live trees.—Growing-stock, rough, and rotten trees 1.0 inch d.b.h. and larger.

Log grade.—A log classification based on external characteristics as indicators of quality or value. Log grade was assigned to a sample of softwood sawtimber trees throughout the State during the 1996 inventory. Also see Tree grade. (See Appendix for specific grading factors used.)

Logging residue.—The unused portions of cut trees, plus unused trees killed by logging.

Marsh.—Nonforest land that characteristically supports low, generally herbaceous or shrubby vegetation, and that is intermittently covered with water.

Merchantable.—Refers to a pulpwood or saw-log section that meets pulpwood or saw-log specifications, respectively.

Miscellaneous Federal land.—Federal land other than National Forest and land administered by the Bureau of Land Management, Corps of Engineers, or Bureau of Indian Affairs.

National Forest land.—Federal land that has been legally designated as National Forest or purchase units, and other land administered by the USDA Forest Service.

Net volume.—Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Noncommercial species.—Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial wood products.

Nonforest land.—Land that has never supported forests, and land formerly forested where use for timber management is precluded by development for other uses. (Note: Includes areas used for crops, active Christmas tree plantations as indicated by annual shearing, orchards, nurseries, improved pasture, residential areas, city parks, improved roads of any width and adjoining clearings, powerline clearings of any width, and 1- to 40-acre areas of water classified by the Bureau of the Census as land.) If intermingled in forest areas, unimproved roads and nonforest strips must be more than 120 feet wide and more than 1 acre in area to qualify as nonforest land.

Nonforest land without trees.—Nonforest land with no live trees present.

Nonforest land with trees.—Nonforest land with one or more trees per acre at least 5 inches d.b.h.

Nonstocked land.—Timberland less than 10 percent stocked with all live trees.

Other forest land.—Forest land not capable of producing 20 cubic feet per acre per year of industrial wood crops under natural conditions and not associated with urban or rural development. Many of these sites contain tree species that are not currently used for industrial wood production or trees of poor

form, small size, or inferior quality that are unfit for most industrial products. Unproductivity may be the result of adverse site conditions such as sterile soil, dry climate, poor drainage, high elevation, and rockiness. This land is not withdrawn from timber use.

Other removals.—Growing-stock trees removed but not used for products, or trees left standing but “removed” from the timberland classification by land-use change. Examples are removals from cultural operations such as timber stand improvement work and land clearing, and the standing volume on land classified originally as timberland but later designated as reserved from timber harvesting (such as a newly established State park).

Pasture.—Land presently used for grazing or under cultivation to develop grazing.

Physiographic class.—A measure of soil and water conditions that affect tree growth on a site. The physiographic classes are:

Xeric sites.—Very dry soils where excessive drainage seriously limits both growth and species occurrence. Example: rocky south-facing outcrops in the Pine Ridge.

Xeromesic sites.—Moderately dry soils where excessive drainage limits growth and species occurrence to some extent. Example: dry oak ridge.

Mesic sites.—Deep, well-drained soils. Growth and species occurrence are limited only by climate. Example: well-drained terraces of loamy soil.

Hydromesic sites.—Moderately wet soils where insufficient drainage or infrequent flooding limits growth and species occurrence to some extent. Example: moderately drained bottomland hardwood sites.

Hydric sites.—Very wet sites where excess water seriously limits both growth and species occurrence. Example: frequently flooded river bottoms.

Plant byproducts.—Plant residues used for products such as mulch, pulp chips, and fuelwood.

Plantation.—An artificially reforested area sufficiently productive to qualify as timberland. The planted species is not necessarily predominant. Christmas tree plantations, which are considered cropland, are not included.

Plant residues.—Wood and bark materials generated at manufacturing plants during production of other products.

Poletimber stand.—(See Stand-size class.)

Poletimber tree.—A live tree of commercial species at least 5.0 inches d.b.h., but smaller than sawtimber size.

Potential productivity class.—A classification of forest land in terms of inherent capacity to grow crops of industrial wood. The class identifies the potential growth in merchantable cubic feet/acre/year at culmination of mean annual increment of fully stocked natural stands.

Private individual land.—Privately owned land not owned by forest industry. This class includes the formerly used Farmer and Miscellaneous private classes.

Reserved forest land.—Forest land withdrawn from timber use through statute, administrative regulation, or designation. Note: Historically, Christmas tree plantations were classified as reserved forest land. However, Christmas tree plantations are now classified as cropland.

Rotten tree.—Live trees of commercial species that do not contain at least one 12-foot saw log or two saw logs 8 feet or longer, now or prospectively, and/or do not meet regional specifications for freedom from defect primarily because of rot; that is, when more than 50 percent of the cull volume in a tree is rotten.

Rough tree.—(a) Live trees of commercial species that do not contain at least one merchantable 12-foot saw log or two saw logs 8 feet or longer, now or prospectively, and/or do not meet regional specifications for freedom from defect primarily because of roughness or poor form, and (b) all live trees of noncommercial species.

Roundwood products.—Logs, bolts, or other round sections (including chips from roundwood) cut from trees for industrial or consumer uses. (Note: Includes saw logs, veneer logs, and bolts; cooperage logs and bolts; pulpwood; fuelwood; pilings; poles; posts; hewn ties; mine timbers; and various other round, split, or hewn products.)

Salvable dead tree.—A standing or down dead tree considered merchantable by regional standards.

Sapling.—A live tree 1.0 to 5.0 inches d.b.h.

Sapling-seedling stand.—(See Stand-size class.)

Saw log.—A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, sound and straight and with a minimum diameter outside bark (d.o.b.) for softwoods of 7.0 inches (9.0 inches for hardwoods) or other combinations of size and defect specified by regional standards.

Saw-log portion.—That part of the bole of sawtimber trees between the stump and the saw-log top.

Saw-log top.—The point on the bole of sawtimber trees above which a saw log cannot be produced. The minimum saw-log top is 7.0 inches d.o.b. for softwoods and 9.0 inches d.o.b. for hardwoods.

Sawtimber stand.—(See Stand-size class.)

Sawtimber tree.—A live tree of commercial species containing at least a 12-foot saw log or two noncontiguous saw logs 8 feet or longer, and meeting regional specifications for freedom from defect. Softwoods must be at least 9.0 inches d.b.h. Hardwoods must be at least 11.0 inches d.b.h.

Sawtimber volume.—Net volume of the saw-log portion of live sawtimber in board feet, International 1/4-inch rule (unless specified otherwise), from stump to a minimum 7.0 inches top d.o.b. for softwoods and a minimum 9.0 inches top d.o.b. for hardwoods.

Seedling.—A live tree less than 1.0 inch d.b.h. that is expected to survive. Only softwood seedlings more than 6 inches tall and hardwood seedlings more than 1 foot tall are counted.

Short-log (rough tree).—A sawtimber-size tree of commercial species that contains at least one merchantable 8- to 11-foot saw log but not a 12-foot saw log.

Shrub.—A woody, perennial plant differing from a perennial herb in its persistent and woody stem(s) and less definitely from a tree in its lower stature and/or the general absence of a well-defined main stem. For this report, shrubs were separated somewhat arbitrarily into tall and low shrubs as follows:

Tall shrubs.—Normally taller than 1.6 to 3.2 feet.

Low shrubs.—Normally shorter than 1.6 to 3.2 feet. (Woody perennial vines, such as grape, were included with low shrubs.)

Shrub and tree seedling biomass.—The total aboveground weight of trees less than 1.0 inch in diameter and all shrubs.

Site index.—An expression of forest site quality based on the height of a free-growing dominant or codominant tree of a representative species in the forest type at age 50.

Soft hardwoods.—Hardwood species with an average specific gravity less than 0.50, such as cottonwood, red maple, basswood, and willow.

Softwoods.—Coniferous trees, usually evergreen, having needles or scale-like leaves.

Stand.—A group of trees on a minimum of 1 acre of forest land that is stocked by forest trees of any size.

Stand-age class.—A classification based on age of the main stand. Main stand refers to trees of the dominant forest type and stand-size class.

Stand-size class.—A classification of stocked (see Stocking) forest land based on the size class of live trees on the area; that is, sawtimber, poletimber, or seedlings and saplings.

Sawtimber stands.—Stands with half or more of live tree stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands.—Stands with half or more of live tree stocking in poletimber and/or sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

Sapling-seedling stands.—Stands with more than half of the live tree stocking in saplings and/or seedlings.

State land.—Land owned by the State of Nebraska or leased to it for 50 years or more.

Stocking.—The degree of occupancy of land by all live trees, measured by basal area and/or the number of trees in a stand by size or age and spacing, compared to the basal area and/or number of trees required to fully use the growth potential of the land; that is, the stocking standard. A stocking percent of 100 indicates full use of the site and is equivalent to 80 square feet of basal area per acre in trees 5.0 inches d.b.h. and larger. In a stand of trees less than 5 inches d.b.h., a stocking percent of 100 would indicate that the present number of trees is sufficient to produce 80 square feet of basal area per acre when the trees reach 5 inches d.b.h.

Stands are grouped into the following stocking classes:

Overstocked stands.—Stands in which stocking of live trees is 100 percent or more.

Fully stocked stands.—Stands in which stocking of live trees is from 60 to 100 percent.

Medium stocked stands.—Stands in which stocking of live trees is from 35 to 60 percent.

Poorly stocked stands.—Stands in which stocking of live trees is from 10 to 35 percent.

Nonstocked areas.—Timberland on which stocking of live trees is less than 10 percent.

Timber products output.—All timber products cut from roundwood and byproducts of wood manufacturing plants. Roundwood products include logs, bolts, or other round sections cut from growing-stock trees, cull trees, salvable dead trees, trees on nonforest land, noncommercial species, sapling-size trees, and limbwood. Byproducts from primary manufacturing plants include slabs, edging, trimmings, miscuts, sawdust, shavings, veneer cores and clippings, and screenings of pulpmills that are used as pulpwood chips or other products.

Timberland.—Forest land that is producing, or is capable of producing, more than 20 cubic feet per acre per year of industrial wood crops under natural conditions, that is not withdrawn from timber use, and that is not associated with urban or rural development. Currently inaccessible and inoperable

areas are included. (Timberland was formerly called commercial forest land.)

Tree.—A woody plant usually having one or more erect perennial stems, a stem diameter at breast height of at least 3 inches, a more or less definitely formed crown of foliage, and a height of at least 13 feet at maturity.

Tree biomass.—The total aboveground weight (including the bark but excluding the foliage) of all trees from 1 to 5 inches in d.b.h., and the total aboveground weight (including the bark but excluding the foliage) from a 1-foot stump for trees more than 5 inches in diameter.

Tree grade.—A classification of the lower 16 feet of the bole of standing trees based on external characteristics as indicators of the quality and quantity of lumber that could be produced from the tree. Tree grade was assigned to a sample of hardwood sawtimber trees during the 1994 inventory. Also see Log grade. (See Appendix for specific grading factors used.)

Tree size class.—A classification of trees based on diameter at breast height, including sawtimber trees, poletimber trees, saplings, and seedlings.

Upper stem portion.—That part of the bole of sawtimber trees above the saw-log top to a minimum top diameter of 4.0 inches d.o.b. or to the point where the central stem breaks into limbs.

Urban and other areas.—Areas within the legal boundaries of cities and towns; suburban areas developed for residential, industrial, or recreational purposes; school yards; cemeteries; roads; railroads; airports; beaches; powerlines and other rights-of-way; or other nonforest land not included in any other specified land use class.

Urban forest land.—Land that would otherwise meet the criteria for timberland, but it is in an urban-suburban area surrounded by commercial, industrial, or residential development and not likely to be managed for the production of industrial wood products on a continuing basis. Wood removed would be for land clearing, fuelwood, or esthetic purposes. Such forest land may be associated with industrial, commercial, residential

subdivision, industrial parks, golf course perimeters, airport buffer strips, and public urban parks that qualify as forest land.

Water.—(a) *Bureau of the Census.*—Permanent inland water surfaces, such as lakes, reservoirs, and ponds at least 40 acres in area; and streams, sloughs, estuaries, and canals at least one-eighth of a statute mile wide.

(b) *Noncensus.*—Permanent inland water surfaces, such as lakes, reservoirs, and ponds from 1 to 39.9 acres in area; and streams, sloughs, estuaries, and canals from 120 feet to one-eighth of a statute mile wide.

Wooded pasture.—Improved pasture with more than 10 percent stocking in live trees, but less than 25 percent stocking in growing-stock trees. Area is currently improved for grazing or there is other evidence of grazing.

Wooded strip.—An acre or more of natural continuous forest land that would otherwise meet survey standards for timberland except that it is less than 120 feet wide.

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(In thousand acres)

Forest Survey Unit	Total land ¹ area	Total forest land	Forest land			Other ² land
			Timberland	Reserved forest land	Other forest land	
Eastern Unit	22,397.5	548.2	540.4	7.8	--	21,849.3
Western Unit	27,109.7	399.5	358.0	23.9	17.6	26,710.2
Total	49,507.2	947.7	898.4	31.7	17.6	48,559.5
Natural Resources Districts ³						
Upper Niobrara-White	4,191.3	173.6	148.5	17.6	7.5	4,017.7
Middle Niobrara	2,957.7	38.8	37.4	--	1.4	2,918.9
Lower Niobrara	1,706.6	69.1	65.9	--	3.2	1,637.5
North, South, and Twin Platte/Upper Loup	11,963.2	58.6	50.5	5.8	2.3	11,904.6
Lower Loup	5,107.0	77.1	77.1	--	--	5,029.9
Upper, Middle, and Lower Republican	5,744.8	37.5	36.1	1.4	--	5,707.3
Central Platte/Tri Basin	3,080.5	48.9	48.9	--	--	3,031.6
Upper and Lower Elkhorn	4,579.0	53.2	50.9	--	2.3	4,525.8
Lewis and Clark	948.0	61.5	61.5	--	--	886.5
Papio-Missouri River	1,110.8	104.7	104.7	--	--	1,006.1
Lower Platte North/Upper Big Blue	2,871.1	34.3	33.5	--	0.8	2,836.8
Lower Platte South	1,067.5	44.6	42.6	2.0	--	1,022.9
Little Blue	1,552.2	30.3	30.3	--	--	1,521.9
Lower Big Blue	1,058.5	37.2	35.3	1.9	--	1,021.3
Nemaha	1,569.0	78.2	75.2	3.0	--	1,490.8

¹ From U.S. Bureau of the Census, 1990.² Includes 175.3 thousand acres of water according to FIA standards of area classification, but defined by the Bureau of the Census as land.³ No sub-unit containing less than 30,000 acres of forest land is listed due to national sampling error restrictions. Units with less than 30,000 acres are combined until the minimum acreage is attained.

Table 2. -- Area of timberland by Forest Survey Unit, Natural Resources Districts, and ownership class, Nebraska, 1994

(In thousand acres)

Forest Survey Unit	All ownerships	National forest	Other federal	State	County and municipal	Indian	Corporate	Individual
Eastern Unit	540.4	--	1.6	22.9	6.8	16.4	5.9	486.8
Western Unit	358.0	46.9	--	26.8	2.9	0.8	15.1	265.5
Total	898.4	46.9	1.6	49.7	9.7	17.2	21.0	752.3
Natural Resources Districts								
Upper Niobrara-White	148.5	40.0	--	13.4	2.9	--	2.7	89.5
Middle Niobrara	37.4	--	--	5.9	--	--	4.7	26.8
Lower Niobrara	65.9	--	--	1.1	--	--	2.0	62.8
North, South, and Twin Platte/Upper Loup	50.5	6.9	--	5.4	--	--	3.0	35.2
Lower Loup	77.1	--	--	--	2.1	--	--	75.0
Upper, Middle, and Lower Republican	36.1	--	0.4	4.1	--	--	1.1	30.5
Central Platte/Tri Basin	48.9	--	0.6	3.3	--	--	2.0	43.0
Upper and Lower Elkhorn	50.9	--	--	0.7	--	--	1.9	48.3
Lewis and Clark	61.5	--	--	2.5	--	5.7	0.4	52.9
Papio-Missouri River	104.7	--	--	4.3	--	11.5	0.7	88.2
Lower Platte North/Upper Big Blue	33.5	--	0.2	1.5	--	--	1.2	30.6
Lower Platte South	42.6	--	--	1.6	1.4	--	--	39.6
Little Blue	30.3	--	0.4	2.2	--	--	1.3	26.4
Lower Big Blue	35.3	--	--	1.6	1.4	--	--	32.3
Nemaha	75.2	--	--	2.1	1.9	--	--	71.2

Table 3. -- Area of timberland by Forest Survey Unit, Natural Resources Districts, forest type group/ local type, Nebraska, 1994

(In thousand acres)

Forest Survey Unit	Forest type group/local type														
	Ponderosa pine		Eastern redcedar			Oak-hickory			Elm-ash-cottonwood				Maple-beech-birch	Elm-ash-locust	Non-stocked
	All types	Ponderosa pine	Total	Eastern redcedar	Eastern	Total	Bur oak	Oak-hickory	Total	Cottonwood	Elm-ash-cottonwood	Willow	Maple-basswood	Elm-ash-locust	Non-stocked
					redcedar-hardwood										
Eastern Unit	540.4	2.4	49.4	25.0	24.4	73.9	43.4	30.5	161.8	67.2	91.3	3.3	73.3	177.9	1.7
Western Unit	358.0	171.6	60.5	27.0	33.5	39.1	31.9	7.2	44.0	35.5	6.8	1.7	7.6	25.4	9.8
Total	898.4	174.0	109.9	52.0	57.9	113.0	75.3	37.7	205.8	102.7	98.1	5.0	80.9	203.3	11.5
Natural Resources Districts															
Upper Niobrara-White	148.5	132.4	--	--	--	--	--	--	3.2	3.0	0.2	--	--	7.2	5.7
Middle Niobrara	37.4	13.7	10.7	2.8	7.9	5.6	4.2	1.4	6.3	5.2	0.2	0.9	0.2	0.9	--
Lower Niobrara	65.9	6.9	19.2	11.3	7.9	8.8	6.5	2.3	16.4	9.5	6.9	--	4.6	9.6	0.4
North, South, and Twin Platte/Upper Loup	50.5	18.6	10.2	3.1	7.1	4.8	3.6	1.2	10.0	7.8	1.4	0.8	0.2	2.8	3.9
Lower Loup	77.1	--	22.0	6.6	15.4	3.9	3.9	--	18.5	6.9	11.6	--	2.4	30.3	--
Upper, Middle, and Lower Republican	36.1	--	5.7	4.2	1.5	1.1	--	1.1	22.4	15.6	6.8	--	1.4	5.5	--
Central Platte/Tri Basin	48.9	--	8.6	5.8	2.8	2.0	--	2.0	26.5	14.4	12.1	--	2.8	9.0	--
Upper and Lower Elkhorn	50.9	--	15.5	8.8	6.7	7.7	6.1	1.6	14.1	8.1	6.0	--	3.7	9.6	0.3
Lewis and Clark	61.5	--	0.7	0.7	--	19.4	16.4	3.0	8.7	3.7	5.0	--	16.5	16.2	--
Papio-Missouri River	104.7	--	1.1	1.1	--	32.0	26.9	5.1	16.7	8.2	8.5	--	27.3	27.6	--
Lower Platte North/Upper Big Blue	33.5	--	6.9	3.9	3.0	3.4	2.2	1.2	14.3	7.4	6.9	--	2.7	6.1	0.1
Lower Platte South	42.6	0.7	1.0	--	1.0	6.2	1.5	4.7	9.1	1.1	7.0	1.0	4.9	20.4	0.3
Little Blue	30.3	--	5.5	3.7	1.8	1.3	--	1.3	16.4	9.1	7.3	--	1.5	5.6	--
Lower Big Blue	35.3	0.7	0.8	--	0.8	4.6	1.1	3.5	7.7	0.9	5.9	0.9	4.0	17.2	0.3
Nemaha	75.2	1.0	2.0	--	2.0	12.2	2.9	9.3	15.5	1.8	12.3	1.4	8.7	35.3	0.5

Table 4. -- Area of timberland by Forest Survey Unit, Natural Resources Districts,
and stand-size class, Nebraska, 1994

(In thousand acres)

Forest Survey Unit	All stands	Stand-size class			
		Sawtimber	Poletimber	Sapling- seedling	Non- stocked
Eastern Unit	540.4	313.4	159.1	66.2	1.7
Western Unit	358.0	231.8	79.8	36.6	9.8
Total	898.4	545.2	238.9	102.8	11.5
Natural Resources Districts					
Upper Niobrara-White	148.5	118.5	12.4	11.9	5.7
Middle Niobrara	37.4	23.8	12.4	1.2	--
Lower Niobrara	65.9	35.1	20.4	10.0	0.4
North, South, and Twin Platte/Upper Loup	50.5	30.9	10.8	4.9	3.9
Lower Loup	77.1	44.4	30.2	2.5	--
Upper, Middle, and Lower Republican	36.1	25.9	4.3	5.9	--
Central Platte/Tri Basin	48.9	33.3	7.6	8.0	--
Upper and Lower Elkhorn	50.9	24.0	16.6	10.0	0.3
Lewis and Clark	61.5	29.9	28.3	3.3	--
Papio-Missouri River	104.7	51.9	46.3	6.5	--
Lower Platte North/Upper Big Blue	33.5	17.8	9.2	6.4	0.1
Lower Platte South	42.6	24.6	9.9	7.8	0.3
Little Blue	30.3	20.6	4.5	5.2	--
Lower Big Blue	35.3	19.8	7.9	7.3	0.3
Nemaha	75.2	44.7	18.1	11.9	0.5

Table 5. -- Area of timberland by Forest Survey Unit, Natural Resources Districts,
and potential productivity class, Nebraska, 1994

(In thousand acres)

Forest Survey Unit	All classes	Potential productivity class (cubic feet of growth per acre per year)			
		120+	85-119	50-84	20-49
Eastern Unit	540.4	21.4	111.5	199.3	208.2
Western Unit	358.0	2.0	61.3	70.2	224.5
Total	898.4	23.4	172.8	269.5	432.7
Natural Resources Districts					
Upper Niobrara-White	148.5	2.0	32.1	25.3	89.1
Middle Niobrara	37.4	- -	1.2	9.9	26.3
Lower Niobrara	65.9	1.3	13.7	20.0	30.9
North, South, and Twin Platte/Upper Loup	50.5	- -	1.3	9.7	39.5
Lower Loup	77.1	- -	6.5	13.9	56.7
Upper, Middle, and Lower Republican	36.1	0.8	6.6	14.8	13.9
Central Platte/Tri Basin	48.9	1.5	11.9	19.4	16.1
Upper and Lower Elkhorn	50.9	0.9	9.6	14.4	26.0
Lewis and Clark	61.5	1.5	16.6	23.1	20.3
Papio-Missouri River	104.7	2.6	28.3	40.2	33.6
Lower Platte North/Upper Big Blue	33.5	0.7	5.1	12.5	15.2
Lower Platte South	42.6	3.0	9.1	15.3	15.2
Little Blue	30.3	0.9	7.6	11.8	10.0
Lower Big Blue	35.3	2.4	7.7	12.8	12.4
Nemaha	75.2	5.8	15.5	26.4	27.5

Table 6. -- Area of timberland by Forest Survey Unit, Natural Resources Districts,
and stocking class of growing-stock trees ¹, Nebraska, 1994

(In thousand acres)

Forest Survey Unit	All classes	Stocking class of growing-stock trees				
		Nonstocked ²	Poorly stocked	Moderately stocked	Fully stocked	Over- stocked
Eastern Unit	540.4	34.8	262.7	152.7	90.2	--
Western Unit	358.0	25.6	213.3	99.5	16.2	3.4
Total	898.4	60.4	476.0	252.2	106.4	3.4
Natural Resources Districts						
Upper Niobrara-White	148.5	10.9	97.0	38.8	1.8	--
Middle Niobrara	37.4	1.4	22.1	11.1	2.8	--
Lower Niobrara	65.9	0.8	41.1	16.2	6.1	1.7
North, South, and Twin Platte/Upper Loup	50.5	12.5	22.2	13.1	2.7	--
Lower Loup	77.1	8.0	55.4	10.6	3.1	--
Upper, Middle, and Lower Republican	36.1	0.4	10.1	16.2	9.4	--
Central Platte/Tri Basin	48.9	0.8	16.2	21.2	10.7	--
Upper and Lower Elkhorn	50.9	0.6	31.6	12.0	5.5	1.2
Lewis and Clark	61.5	5.0	25.9	17.8	12.8	--
Papio-Missouri River	104.7	7.3	45.5	30.1	21.8	--
Lower Platte North/Upper Big Blue	33.5	0.6	16.6	10.4	5.4	0.5
Lower Platte South	42.6	3.4	22.9	11.5	4.8	--
Little Blue	30.3	0.4	10.3	12.8	6.8	--
Lower Big Blue	35.3	3.0	19.1	9.5	3.7	--
Nemaha	75.2	5.3	40.0	20.9	9.0	--

¹ This table is based on the stocking percent of growing-stock trees,
rather than that of "live" trees. For this table, to use the definition of
stocking found in the appendix, replace the term "live trees" with "growing-stock trees."

² Area of nonstocked in this table and table 8 differs from that in other tables in this
report because this table includes land stocked with only growing-stock trees,
rather than with "live" trees.

Table 7. -- Area of timberland by forest type group/local type and ownership class, Nebraska, 1994

(In thousand acres)

Forest type group by local type	All ownerships	Ownership class								
		Total public	Public				Total private	Private		
			National forest	Other federal	State	County and municipal		Indian	Corporate	Individual
Ponderosa pine										
Ponderosa pine	174.0	63.1	46.9	--	13.3	2.9	110.9	--	3.8	107.1
Total	174.0	63.1	46.9	--	13.3	2.9	110.9	--	3.8	107.1
Eastern redcedar										
Eastern redcedar	52.0	1.7	--	--	1.7	--	50.3	--	--	50.3
Eastern redcedar-hardwood	57.9	5.7	--	--	5.7	--	52.2	--	4.1	48.1
Total	109.9	7.4	--	--	7.4	--	102.5	--	4.1	98.4
Oak-hickory										
Bur oak	75.3	--	--	--	--	--	75.3	1.5	2.0	71.8
Oak-hickory	37.7	--	--	--	--	--	37.7	1.7	1.9	34.1
Total	113.0	--	--	--	--	--	113.0	3.2	3.9	105.9
Elm-ash-cottonwood										
Cottonwood	102.7	17.7	--	1.6	14.9	1.2	85.0	2.9	8.2	73.9
Elm-ash-cottonwood	98.1	7.4	--	--	6.5	0.9	90.7	--	1.0	89.7
Willow	5.0	--	--	--	--	--	5.0	--	--	5.0
Total	205.8	25.1	--	1.6	21.4	2.1	180.7	2.9	9.2	168.6
Maple-beech-birch										
Maple-basswood	80.9	--	--	--	--	--	80.9	9.2	--	71.7
Total	80.9	--	--	--	--	--	80.9	9.2	--	71.7
Elm-ash-locust										
Elm-ash-locust	203.3	11.2	--	--	7.6	3.6	192.1	1.9	--	190.2
Total	203.3	11.2	--	--	7.6	3.6	192.1	1.9	--	190.2
Nonstocked	11.5	1.1	--	--	--	1.1	10.4	--	--	10.4
All types	898.4	107.9	46.9	1.6	49.7	9.7	790.5	17.2	21.0	752.3

Table 8. -- Area of timberland by ownership class and stocking class of growing-stock trees ¹, Nebraska, 1994

(In thousand acres)

Ownership class	All classes	Stocking class of growing-stock trees				
		Nonstocked ²	Poorly stocked	Moderately stocked	Fully stocked	Over-stocked
Public						
National forest	46.9	2.7	30.2	14.0	--	--
Other federal	1.6	--	--	1.6	--	--
State	49.7	1.6	20.5	18.3	9.3	--
County and municipal	9.7	1.1	--	7.4	1.2	--
Total	107.9	5.4	50.7	41.3	10.5	--
Private						
Indian	17.2	--	7.2	5.7	4.3	--
Corporate	21.0	0.8	13.6	6.6	--	--
Individual	752.3	54.2	404.5	198.6	91.6	3.4
Total	790.5	55.0	425.3	210.9	95.9	3.4
All ownerships	898.4	60.4	476.0	252.2	106.4	3.4

¹ This table is based on the stocking percent of growing-stock trees, rather than that of "live" trees. For this table, to use the definition of stocking found in the Appendix, replace the term "live trees" with "growing-stock trees."

² Area of nonstocked in this table and table 6 differs from that in other tables in this report because this table includes land stocked with only growing-stock trees, rather than with "live" trees.

Table 9. -- Area of timberland by forest type group/local type and stand-size class, Nebraska, 1994

(In thousand acres)

Forest type group by local type	All stands	Stand-size class			Non- stocked
		Sawtimber	Poletimber	Sapling- seedling	
Ponderosa pine					
Ponderosa pine	174.0	144.1	14.8	15.1	--
Total	174.0	144.1	14.8	15.1	--
Eastern redcedar					
Eastern redcedar	52.0	3.0	24.1	24.9	--
Eastern redcedar-hardwood	57.9	33.6	19.2	5.1	--
Total	109.9	36.6	43.3	30.0	--
Oak-hickory					
Bur oak	75.3	27.7	47.6	--	--
Oak-hickory	37.7	27.2	10.5	--	--
Total	113.0	54.9	58.1	--	--
Elm-ash-cottonwood					
Cottonwood	102.7	91.7	5.6	5.4	--
Elm-ash-cottonwood	98.1	73.7	9.8	14.6	--
Willow	5.0	--	2.6	2.4	--
Total	205.8	165.4	18.0	22.4	--
Maple-beech-birch					
Maple-basswood	80.9	50.0	26.9	4.0	--
Total	80.9	50.0	26.9	4.0	--
Elm-ash-locust					
Elm-ash-locust	203.3	94.2	77.8	31.3	--
Total	203.3	94.2	77.8	31.3	--
Nonstocked	11.5	--	--	--	11.5
All types	898.4	545.2	238.9	102.8	11.5

Table 10. -- Number of all live trees on timberland by species group and diameter class, Nebraska, 1994

(In thousand trees)

Species group	All	Diameter class (inches at breast height)											
	classes	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods													
Ponderosa pine	36,681	9,275	6,879	5,687	4,400	3,820	2,803	1,678	1,129	615	249	146	--
Eastern redcedar	50,819	27,808	11,155	6,278	3,262	1,493	481	282	27	18	10	5	--
Other softwoods	1,333	960	201	89	--	64	19	--	--	--	--	--	--
Total softwoods	88,833	38,043	18,235	12,054	7,662	5,377	3,303	1,960	1,156	633	259	151	--
Hardwoods													
Select white oak	22,822	1,842	4,211	5,341	3,341	3,106	1,908	945	849	484	267	410	118
Select red oak	1,501	486	129	35	200	259	127	126	62	28	12	27	10
Other red oak	485	--	--	290	--	121	19	37	9	9	--	--	--
Select hickory	919	459	114	144	99	73	21	--	--	6	--	3	--
Other hickory	1,932	1,119	198	163	242	105	81	--	18	--	6	--	--
Basswood	11,912	6,252	2,400	1,579	420	261	314	229	216	108	65	62	6
Silver maple	1,637	360	123	89	314	255	189	74	69	55	38	55	16
Elm	48,407	21,400	13,000	6,667	3,296	1,889	1,342	399	222	116	38	38	--
White & green ash	29,739	14,742	4,611	3,644	2,956	1,307	934	628	362	269	80	196	10
Cottonwood	13,964	2,532	1,939	1,451	1,490	903	1,099	777	790	743	612	1,200	428
Willow	2,994	1,209	393	275	208	230	195	197	128	70	45	44	--
Hackberry	23,626	13,122	4,519	2,380	1,430	868	418	438	182	81	58	104	26
Black cherry	611	399	--	--	61	138	13	--	--	--	--	--	--
Black walnut	2,907	537	569	483	284	458	204	176	74	73	36	13	--
Other hardwoods	32,457	12,762	8,119	5,164	2,283	1,478	1,068	612	343	266	183	175	4
Total hardwoods	195,913	77,221	40,325	27,705	16,624	11,451	7,932	4,638	3,324	2,308	1,440	2,327	618
Noncommercial spp.	19,742	12,063	5,097	1,631	518	343	29	16	--	--	39	6	--
All species	304,488	127,327	63,657	41,390	24,804	17,171	11,264	6,614	4,480	2,941	1,738	2,484	618

Table 11. -- Number of growing-stock trees on timberland by species group and diameter class, Nebraska, 1994

(In thousand trees)

Species group	All classes	Diameter class (inches at breast height)											
		1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods													
Ponderosa pine	27,838	7,999	4,704	3,526	3,089	2,772	2,398	1,409	993	590	212	146	--
Eastern redcedar	47,545	27,454	10,141	5,466	2,771	1,002	416	241	23	16	10	5	--
Other softwoods	1,202	912	201	89	--	--	--	--	--	--	--	--	--
Total softwoods	76,585	36,365	15,046	9,081	5,860	3,774	2,814	1,650	1,016	606	222	151	--
Hardwoods													
Select white oak	10,473	1,563	1,688	2,107	1,231	1,419	759	495	493	255	170	255	38
Select red oak	1,422	486	129	35	188	234	122	118	56	23	6	19	6
Other red oak	457	--	--	290	--	121	19	18	9	--	--	--	--
Select hickory	892	459	114	144	99	57	10	--	--	6	--	3	--
Other hickory	1,582	1,014	96	123	177	105	52	--	15	--	--	--	--
Basswood	10,133	5,538	2,010	1,456	299	209	190	167	126	78	18	36	6
Silver maple	902	246	66	50	224	115	34	56	42	22	22	15	10
Elm	34,787	19,042	8,872	3,493	1,888	903	317	115	75	49	24	9	--
White & green ash	22,365	14,184	2,616	2,051	1,587	609	423	367	232	155	43	88	10
Cottonwood	12,157	2,418	1,765	1,246	1,271	803	882	602	679	635	500	1,017	339
Willow	2,010	1,041	153	160	123	145	146	83	80	40	22	17	--
Hackberry	20,249	12,453	3,727	1,886	833	560	285	238	128	44	32	54	9
Black cherry	396	324	--	--	--	72	--	--	--	--	--	--	--
Black walnut	2,220	537	350	436	205	381	72	120	42	49	21	7	--
Other hardwoods	15,523	9,891	3,034	1,408	508	208	182	157	58	45	3	25	4
Total hardwoods	135,568	69,196	24,620	14,885	8,633	5,941	3,493	2,536	2,035	1,401	861	1,545	422
All species	212,153	105,561	39,666	23,966	14,493	9,715	6,307	4,186	3,051	2,007	1,083	1,696	422

Table 12. -- Net volume of growing stock on timberland by species group and diameter class, Nebraska, 1994

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods											
Ponderosa pine	166,949	6,726	12,474	21,564	30,382	26,968	26,954	22,215	9,990	9,676	--
Eastern redcedar	42,277	11,603	12,249	7,674	4,805	4,214	561	511	383	277	-
Other softwoods	133	133	--	--	--	--	--	--	--	--	--
Total softwoods	209,359	18,462	24,723	29,238	35,187	31,182	27,515	22,726	10,373	9,953	--
Hardwoods											
Select white oak	104,192	4,817	5,916	12,133	10,452	10,068	14,787	10,229	8,866	21,243	5,681
Select red oak	13,372	78	1,256	2,278	1,649	2,455	1,713	861	286	1,735	1,061
Other red oak	2,434	513	--	948	311	430	232	--	--	--	--
Select hickory	1,809	237	489	419	163	--	--	301	--	200	--
Other hickory	3,420	220	993	864	836	--	507	--	--	--	--
Basswood	26,545	3,106	1,326	2,280	3,117	4,267	4,105	3,278	1,061	2,768	1,237
Silver maple	11,563	101	1,194	1,304	520	1,459	1,422	996	1,295	1,654	1,618
Elm	37,071	7,472	8,813	7,890	4,222	2,436	2,333	1,980	1,282	643	--
White & green ash	57,041	4,696	7,634	5,608	6,254	8,305	7,552	6,534	2,499	6,352	1,607
Cottonwood	306,432	3,312	6,958	8,234	14,384	15,429	23,790	29,114	29,989	96,671	78,551
Willow	13,808	354	617	1,437	2,297	1,938	2,842	1,623	1,277	1,423	--
Hackberry	33,746	3,509	3,667	4,961	3,709	4,635	3,742	1,789	1,696	4,451	1,587
Black cherry	518	--	--	518	--	--	--	--	--	--	--
Black walnut	13,852	1,130	951	3,375	985	2,602	1,166	2,094	1,121	428	--
Other hardwoods	19,229	2,500	2,257	1,743	2,399	3,563	1,763	1,927	151	2,250	676
Total hardwoods	645,032	32,045	42,071	53,992	51,298	57,587	65,954	60,726	49,523	139,818	92,018
All species	854,391	50,507	66,794	83,230	86,485	88,769	93,469	83,452	59,896	149,771	92,018

Table 13. -- Net volume of growing stock in the saw-log portion of sawtimber trees on timberland by species group and diameter class, Nebraska, 1994

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Ponderosa pine	132,325	16,556	26,051	24,437	25,144	21,119	9,601	9,417	-
Eastern redcedar	15,908	6,199	4,193	3,863	527	487	369	270	--
Total softwoods	148,233	22,755	30,244	28,300	25,671	21,606	9,970	9,687	--
Hardwoods									
Select white oak	71,756	--	7,484	8,146	12,862	9,254	8,215	20,261	5,534
Select red oak	8,492	--	1,216	2,018	1,507	780	266	1,668	1,037
Other red oak	795	--	238	359	198	--	--	--	--
Select hickory	577	--	116	--	--	274	--	187	--
Other hickory	1,046	--	602	--	444	--	--	--	--
Basswood	17,597	--	2,432	3,653	3,651	3,005	1,000	2,639	1,217
Silver maple	8,121	--	377	1,218	1,243	907	1,206	1,591	1,579
Elm	10,473	--	2,915	1,959	2,021	1,783	1,189	606	--
White & green ash	33,615	--	4,484	6,779	6,566	5,904	2,324	5,995	1,563
Cottonwood	270,837	--	11,115	13,187	21,261	26,806	28,160	92,986	77,322
Willow	9,431	--	1,549	1,506	2,440	1,433	1,166	1,337	--
Hackberry	18,339	--	2,527	3,645	3,205	1,613	1,565	4,230	1,554
Black walnut	7,069	--	679	2,091	990	1,882	1,025	402	--
Other hardwoods	10,607	--	1,586	2,851	1,494	1,732	138	2,145	661
Total hardwoods	468,755	--	37,320	47,412	57,882	55,373	46,254	134,047	90,467
All species	616,988	22,755	67,564	75,712	83,553	76,979	56,224	143,734	90,467

Table 14. -- Net volume of sawtimber on timberland by species group and diameter class, Nebraska, 1994

(In thousand board feet) ¹

Species group	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Ponderosa pine	710,626	97,027	141,661	128,698	131,637	111,089	50,694	49,820	-
Eastern redcedar	94,836	41,536	24,758	20,661	2,638	2,335	1,719	1,189	--
Total softwoods	805,462	138,563	166,419	149,359	134,275	113,424	52,413	51,009	--
Hardwoods									
Select white oak	406,087	--	49,664	48,494	72,462	50,741	44,692	109,721	30,313
Select red oak	48,532	--	7,735	11,829	8,487	4,328	1,486	9,082	5,585
Other red oak	4,619	--	1,450	2,053	1,116	--	--	--	--
Select hickory	3,349	--	771	--	--	1,509	--	1,069	--
Other hickory	6,542	--	3,993	--	2,549	--	--	--	--
Basswood	106,473	--	16,078	22,399	21,818	17,632	5,802	15,344	7,400
Silver maple	41,611	--	2,162	6,315	6,292	4,526	6,018	8,106	8,192
Elm	60,078	--	19,255	11,367	10,943	9,317	6,152	3,044	--
White & green ash	179,341	--	26,063	36,334	34,331	30,687	12,087	31,519	8,320
Cottonwood	1,447,752	--	63,931	71,915	115,368	144,721	153,170	508,501	390,146
Willow	49,525	--	9,188	8,026	12,685	7,193	5,893	6,540	--
Hackberry	103,644	--	16,885	21,576	17,610	8,525	8,206	22,548	8,294
Black walnut	39,706	--	4,390	12,059	5,490	10,174	5,463	2,130	--
Other hardwoods	57,350	--	9,956	15,234	7,795	8,674	675	11,270	3,746
Total hardwoods	2,554,609	--	231,521	267,601	316,946	298,027	249,644	728,874	461,996
All species	3,360,071	138,563	397,940	416,960	451,221	411,451	302,057	779,883	461,996

¹ International 1/4-inch rule.

Table 15. -- Net volume of sawtimber on timberland by Forest Survey Unit, species group, and grade, Nebraska, 1994

(In thousand board feet) ¹

All Units						Eastern Unit					Western Unit				
Species group	Total	Log grade				Total	Log grade				Total	Log grade			
		Log grade 1	Log grade 2	Log grade 3	Log grade 4		Log grade 1	Log grade 2	Log grade 3	Log grade 4		Log grade 1	Log grade 2	Log grade 3	Log grade 4
Softwoods															
Ponderosa pine	710,626	5,502	32,031	673,093	--	7,763	--	--	7,763	--	702,863	5,502	32,031	665,330	--
Eastern redcedar	94,836	--	--	94,836	--	64,660	--	--	64,660	--	30,176	--	--	30,176	--
Total	805,462	5,502	32,031	767,929	--	72,423	--	--	72,423	--	733,039	5,502	32,031	695,506	--
Species	Total	Tree grade				Total	Tree grade				Total	Tree grade			
		Tree grade 1	Tree grade 2	Tree grade 3	Tie and timber		Tree grade 1	Tree grade 2	Tree grade 3	Tie and timber		Tree grade 1	Tree grade 2	Tree grade 3	Tie and timber
Hardwoods															
Select white oak	406,087	41,403	125,810	187,042	51,832	334,282	40,847	110,204	148,773	34,458	71,805	556	15,606	38,269	17,374
Select red oak	48,532	6,938	27,029	14,565	--	48,532	6,938	27,029	14,565	--	--	--	--	--	--
Other red oak	4,619	--	4,619	--	--	4,619	--	4,619	--	--	--	--	--	--	--
Select hickory	3,349	--	--	3,349	--	3,349	--	--	3,349	--	--	--	--	--	--
Other hickory	6,542	505	2,851	3,186	--	6,542	505	2,851	3,186	--	--	--	--	--	--
Basswood	106,473	37,601	46,397	22,475	--	101,065	36,481	43,022	21,562	--	5,408	1,120	3,375	913	--
Silver maple	41,611	7,661	14,418	19,532	--	41,611	7,661	14,418	19,532	--	--	--	--	--	--
Elm	60,078	8,613	14,158	33,435	3,872	53,408	7,453	14,158	27,925	3,872	6,670	1,160	--	5,510	--
White and green ash	179,341	25,614	55,461	94,652	3,614	135,311	22,819	39,940	71,720	832	44,030	2,795	15,521	22,932	2,782
Cottonwood	1,447,752	758,107	402,035	237,019	50,591	953,248	499,814	258,878	165,713	28,843	494,504	258,293	143,157	71,306	21,748
Willow	49,525	8,525	9,393	23,772	7,835	42,786	7,764	9,393	22,226	3,403	6,739	761	--	1,546	4,432
Hackberry	103,644	34,682	33,571	35,146	245	96,895	34,682	30,760	31,453	--	6,749	--	2,811	3,693	245
Black walnut	39,706	13,946	13,696	11,351	713	35,274	12,449	12,391	9,721	713	4,432	1,497	1,305	1,630	--
Other hardwoods	57,350	13,106	10,513	19,293	14,438	53,459	13,106	10,259	16,624	13,470	3,891	--	254	2,669	968
Total	2,554,609	956,701	759,951	704,817	133,140	1,910,381	690,519	577,922	556,349	85,591	644,228	266,182	182,029	148,468	47,549
All species	3,360,071	962,203	791,982	1,472,746	133,140	1,982,804	690,519	577,922	628,772	85,591	1,377,267	271,684	214,060	843,974	47,549

¹ International 1/4-inch rule.

Table 16. -- Net volume of growing stock and sawtimber on timberland by Forest Survey Unit, Natural Resources Districts, and major species group, Nebraska, 1994

Forest Survey Unit	Growing stock					Sawtimber				
	Major species group					Major species group				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	<i>(In thousand cubic feet)</i>					<i>(In thousand board feet) ¹</i>				
Eastern Unit	517,611	2,103	26,478	326,421	162,609	1,982,804	7,763	64,660	1,320,256	590,125
Western Unit	336,780	164,846	15,932	114,414	41,588	1,377,267	702,863	30,176	523,961	120,267
Total	854,391	166,949	42,410	440,835	204,197	3,360,071	710,626	94,836	1,844,217	710,392
Natural Resources Districts										
Upper Niobrara-White	138,148	123,840	--	9,948	4,360	579,550	520,962	--	43,325	15,263
Middle Niobrara	37,264	13,317	3,920	15,565	4,462	154,134	59,170	8,488	74,139	12,337
Lower Niobrara	77,094	12,159	4,374	50,108	10,453	328,700	53,008	8,652	236,095	30,945
North, South, and Twin Platte/Upper Loup	35,914	10,861	3,459	17,024	4,570	148,985	48,329	7,140	80,015	13,501
Lower Loup	42,207	--	9,679	20,795	11,733	145,899	--	28,680	84,230	32,989
Upper, Middle, and Lower Republican	44,141	--	2,631	36,070	5,440	163,351	--	5,300	135,264	22,787
Central Platte/Tri Basin	56,205	--	4,353	42,093	9,759	223,856	--	7,944	174,740	41,172
Upper and Lower Elkhorn	56,210	5,009	3,391	37,008	10,802	235,671	21,508	6,007	174,428	33,728
Lewis and Clark	59,081	--	1,246	29,707	28,128	210,235	--	3,019	111,639	95,577
Papio-Missouri River	101,345	--	2,122	51,342	47,881	359,976	--	5,144	192,004	162,828
Lower Platte North/Upper Big Blue	35,526	1,763	2,352	24,981	6,430	144,594	7,649	4,588	109,302	23,055
Lower Platte South	37,875	--	590	22,439	14,846	146,678	--	1,417	90,247	55,014
Little Blue	34,971	--	2,747	26,168	6,056	139,385	--	4,959	108,981	25,445
Lower Big Blue	31,258	--	478	18,944	11,836	122,311	--	1,275	77,282	43,754
Nemaha	67,152	--	1,068	38,643	27,441	256,746	--	2,223	152,526	101,997

¹ International 1/4-inch rule.

Table 17. -- Net volume of all live trees and salvable dead trees on timberland
by class of timber and major species group, Nebraska, 1994

(In thousand cubic feet)

Class of timber	All species	Major species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
Live trees					
Growing-stock trees					
Sawtimber					
Saw-log portion	616,988	132,325	15,908	341,161	127,594
Upper stem portion	66,110	15,424	2,517	29,102	19,067
Total	683,098	147,749	18,425	370,263	146,661
Poletimber	171,293	19,200	23,985	70,572	57,536
All growing-stock trees	854,391	166,949	42,410	440,835	204,197
Cull trees					
Short-log trees	97,911	7,474	1,281	51,268	37,888
Rough trees ¹					
Sawtimber size	192,806	13,903	4,585	97,549	76,769
Poletimber size	120,275	8,101	3,708	56,787	51,679
Total	313,081	22,004	8,293	154,336	128,448
Rotten trees ¹					
Sawtimber size	32,828	1,135	92	26,762	4,839
Poletimber size	4,043	408	76	2,420	1,139
Total	36,871	1,543	168	29,182	5,978
All cull trees	447,863	31,021	9,742	234,786	172,314
All live trees	1,302,254	197,970	52,152	675,621	376,511
Salvable dead trees					
Sawtimber size	20,217	4,788	238	12,852	2,339
Poletimber size	8,020	1,462	394	2,945	3,219
All salvable dead trees	28,237	6,250	632	15,797	5,558
All classes	1,330,491	204,220	52,784	691,418	382,069

¹ Includes all noncommercial species.

Table 18. -- Net volume of all live trees and growing-stock trees on timberland by ownership class and major species group, Nebraska, 1994

(In thousand cubic feet)

Ownership class	All live trees					Growing-stock trees				
	All species	Major species group				All species	Major species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
National forest	65,495	64,023	--	1,472	--	53,608	53,608	--	--	--
Other federal	3,294	--	--	3,294	--	3,294	--	--	3,294	--
State	78,952	20,702	3,172	44,781	10,297	65,007	17,508	1,649	39,494	6,356
County and municipal	10,062	3,454	--	6,156	452	9,084	3,316	--	5,316	452
Indian	30,527	--	31	20,621	9,875	19,650	--	--	13,803	5,847
Corporate	31,081	7,351	1,044	17,870	4,816	19,703	6,978	831	10,915	979
Individual	1,082,843	102,440	47,905	581,427	351,071	684,045	85,539	39,930	368,013	190,563
All ownerships	1,302,254	197,970	52,152	675,621	376,511	854,391	166,949	42,410	440,835	204,197

Table 19. -- Net volume of growing stock on timberland by forest type group/local type, and major species group, Nebraska, 1994

(In thousand cubic feet)

Forest type group by local type	All species	Major species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
Softwood type groups					
Ponderosa pine	149,863	148,809	666	- -	388
Total	149,863	148,809	666	- -	388
Eastern redcedar					
Eastern redcedar	23,835	3,369	15,562	3,072	1,832
Eastern redcedar-hardwood	52,332	2,390	15,198	25,561	9,183
Total	76,167	5,759	30,760	28,633	11,015
All softwood types	226,030	154,568	31,426	28,633	11,403
Hardwood type groups					
Oak-hickory					
Oak-hickory	49,092	4,467	476	8,560	35,589
Bur oak	59,979	4,113	2,360	4,125	49,381
Total	109,071	8,580	2,836	12,685	84,970
Elm-ash-cottonwood					
Cottonwood	219,301	- -	2,487	213,969	2,845
Elm-ash-cottonwood	96,881	- -	1,011	73,856	22,014
Willow	850	- -	- -	850	- -
Total	317,032	- -	3,498	288,675	24,859
Maple-beech-birch					
Maple-basswood	83,062	- -	1,175	47,403	34,484
Total	83,062	- -	1,175	47,403	34,484
Elm-ash-locust					
Elm-ash-locust	117,761	2,366	3,475	63,439	48,481
Total	117,761	2,366	3,475	63,439	48,481
All hardwood types	626,926	10,946	10,984	412,202	192,794
Nonstocked	1,435	1,435	- -	- -	- -
All forest types	854,391	166,949	42,410	440,835	204,197

Table 20. -- Average annual net growth of growing stock and sawtimber on timberland by Forest Survey Unit, Natural Resources Districts, and major species group, Nebraska, 1983-1993.

Forest Survey Unit	Growing stock					Sawtimber				
	Species group					Species group				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	<i>(In thousand cubic feet)</i>					<i>(In thousand board feet) ¹</i>				
Eastern Unit	9,832	43	1,200	5,515	3,074	47,917	175	3,900	32,706	11,136
Western Unit	4,443	2,449	488	687	819	18,358	10,055	1,195	3,343	3,765
Total	14,275	2,492	1,688	6,202	3,893	66,275	10,230	5,095	36,049	14,901
National Resources Districts										
Upper Niobrara-White	1,716	1,549	7	76	84	7,891	6,912	- -	486	493
Middle Niobrara	312	88	27	132	65	1,553	327	78	878	270
Lower Niobrara	709	147	170	200	192	3,517	808	782	1,070	857
North, South, and Twin Platte/Upper Loup	924	538	38	273	75	2,731	1,290	68	1,030	343
Lower Loup	746	- -	329	307	110	1,790	- -	834	1,316	-360
Upper, Middle, and Lower Republican	1,091	- -	171	835	85	6,586	- -	255	5,966	365
Central Platte/Tri Basin	1,105	- -	277	672	156	5,364	- -	409	4,274	681
Upper and Lower Elkhorn	705	122	136	224	223	3,832	651	1,247	906	1,028
Lewis and Clark	1,251	- -	47	605	599	6,460	- -	221	3,767	2,472
Papio-Missouri River	2,186	- -	80	1,029	1,077	11,151	- -	376	6,571	4,204
Lower Platte North/Upper Big Blue	596	48	118	315	115	2,919	242	455	1,706	516
Lower Platte South	631	- -	33	319	279	2,589	- -	33	1,578	978
Little Blue	680	- -	176	407	97	3,275	- -	258	2,605	412
Lower Big Blue	532	- -	31	277	224	2,196	- -	32	1,402	762
Nemaha	1,091	- -	48	531	512	4,421	- -	47	2,494	1,880

¹ International 1/4-inch rule.

Table 21. -- Average annual removals of growing stock and sawtimber on timberland by Forest Survey Unit, Natural Resources Districts, and major species group, Nebraska, 1983-1993

Forest Survey Unit	Growing stock					Sawtimber				
	Major species group					Major species group				
	All	Other			Hard	All	Other			Hard
	species	Pine	softwoods	hardwoods	hardwoods	species	Pine	softwoods	hardwoods	hardwoods
	<i>(In thousand cubic feet)</i>						<i>(In thousand board feet) ¹</i>			
Eastern Unit	3,334	--	170	2,643	521	14,881	--	213	12,459	2,209
Western Unit	3,254	2,765	79	286	124	14,586	13,228	276	1,082	--
Total	6,588	2,765	249	2,929	645	29,467	13,228	489	13,541	2,209
Natural Resources Districts										
Upper Niobrara-White	2,380	2,380	--	--	--	11,349	11,349	--	--	--
Middle Niobrara	70	--	--	70	--	222	--	--	222	--
Lower Niobrara	342	--	--	286	56	1,399	--	--	1,399	--
North, South, and Twin Platte/Upper Loup	480	385	--	95	--	2,189	1,879	--	310	--
Lower Loup	128	--	--	27	101	--	--	--	--	--
Upper, Middle, and Lower Republican	334	--	118	194	22	1,030	--	93	839	98
Central Platte/Tri Basin	445	--	70	350	25	1,834	--	168	1,498	168
Upper and Lower Elkhorn	250	--	--	198	52	972	--	--	972	--
Lewis and Clark	389	--	--	373	16	2,374	--	--	2,271	103
Papio-Missouri River	661	--	--	634	27	4,071	--	--	3,889	182
Lower Platte North/Upper Big Blue	196	--	17	166	13	842	--	40	760	42
Lower Platte South	169	--	--	84	85	628	--	106	115	407
Little Blue	282	--	44	222	16	1,145	--	82	950	113
Lower Big Blue	125	--	--	62	63	386	--	--	85	301
Nemaha	337	--	--	168	169	1,026	--	--	231	795

¹ International 1/4-inch rule.

Table 22. -- Average annual net growth and average annual removals of growing stock and sawtimber on timberland by species group, Nebraska, 1983-1993

Species group	Growing stock		Sawtimber	
	Average annual net growth	Average annual removals	Average annual net growth	Average annual removals
	<i>(In thousand cubic feet)</i>		<i>(In thousand board feet) ¹</i>	
Softwoods				
Ponderosa pine	2,492	2,765	10,230	13,228
Eastern redcedar	1,678	249	5,095	489
Other softwoods	10	--	--	--
Total softwoods	4,180	3,014	15,325	13,717
Hardwoods				
Select white oak	1,777	281	9,355	1,347
Other white oak	-14	--	-67	--
Select red oak	250	--	1,177	--
Other red oak	100	--	208	--
Select hickory	38	--	50	--
Other hickory	82	--	232	--
Basswood	429	--	3,708	--
Silver maple	331	30	1,499	--
Elm	1,027	64	3,929	--
White & green ash	1,050	303	2,063	691
Cottonwood	2,787	2,321	19,061	11,847
Willow	87	59	1,187	--
Hackberry	1,463	295	6,603	985
Black cherry	38	--	--	--
Black walnut	289	26	979	--
Other hardwoods	361	195	966	880
Total hardwoods	10,095	3,574	50,950	15,750
All species	14,275	6,588	66,275	29,467

¹ International 1/4-inch rule.

Table 23. -- Average annual mortality of growing stock and sawtimber
on timberland by species group, Nebraska, 1983-1993

Species group	Growing stock average annual mortality (In thousand cubic feet)	Sawtimber average annual mortality (In thousand board feet) ¹
Softwoods		
Ponderosa pine	1,097	3,207
Eastern redcedar	379	967
Total softwoods	1,476	4,174
Hardwoods		
Select white oak	664	2,159
Other white oak	14	68
Select red oak	187	587
Other red oak	28	32
Select hickory	2	--
Other hickory	30	47
Basswood	377	982
Silver maple	121	349
Elm	1,953	3,876
White & green ash	768	1,987
Cottonwood	5,830	24,201
Willow	990	2,761
Hackberry	324	1,038
Black cherry	6	--
Black walnut	128	247
Other hardwoods	403	855
Total hardwoods	11,825	39,189
All species	13,301	43,363

¹ International 1/4-inch rule.

Table 24. -- Average annual net growth and average annual removals of growing stock and sawtimber on timberland by ownership class and major species group, Nebraska, 1983-1993

Ownership class	Average annual net growth of growing stock				
	Major species group				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	<i>(In thousand cubic feet)</i>				
National forest	676	676	--	--	--
Other federal	138	23	--	115	--
State	1,015	106	62	701	146
County and municipal	191	49	--	96	46
Indian	454	--	--	334	120
Corporate	198	110	28	3	57
Individual	11,603	1,528	1,598	4,953	3,524
All ownerships	14,275	2,492	1,688	6,202	3,893

Ownership class	Average annual removals of growing stock				
	Major species group				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	<i>(In thousand cubic feet)</i>				
National forest	394	394	--	--	--
Other federal	319	319	--	--	--
State	425	425	--	--	--
Individual	5,450	1,627	249	2,929	645
All ownerships	6,588	2,765	249	2,929	645

Ownership class	Average annual net growth of sawtimber				
	Major species group				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	<i>(In thousand board feet) ¹</i>				
National forest	3,204	3,204	--	--	--
Other federal	617	117	--	500	--
State	7,272	528	284	5,625	835
County and municipal	1,130	227	--	903	--
Indian	2,205	--	--	1,680	525
Corporate	823	469	44	277	33
Individual	51,024	5,685	4,767	27,064	13,508
All ownerships	66,275	10,230	5,095	36,049	14,901

Ownership class	Average annual removals of sawtimber				
	Major species group				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	<i>(In thousand board feet) ¹</i>				
National forest	2,002	2,002	--	--	--
Other federal	1,616	1,616	--	--	--
State	1,644	1,644	--	--	--
Individual	24,205	7,966	489	13,541	2,209
All ownerships	29,467	13,228	489	13,541	2,209

¹ International 1/4-inch rule.

Table 25. -- Average annual net growth and average annual removals of growing stock and sawtimber on timberland by forest type group/local type, and major species group, Nebraska, 1983-1993

Forest type group by local type	Average annual net growth of growing stock					Average annual removals of growing stock				
	Major species group					Major species group				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	(In thousand cubic feet)					(In thousand cubic feet)				
Softwood type groups										
Ponderosa pine	2,328	2,285	37	--	6	2,373	2,373	--	--	--
Total	2,328	2,285	37	--	6	2,373	2,373	--	--	--
Eastern redcedar										
Eastern redcedar	1,121	65	842	167	47	580	--	249	262	69
Eastern redcedar-hardwood	625	18	289	133	185	116	--	--	--	116
Total	1,746	83	1,131	300	232	696	--	249	262	185
All softwood types	4,074	2,368	1,168	300	238	3,069	2,373	249	262	185
Hardwood type groups										
Oak-hickory										
Oak-hickory	1,106	99	56	257	694	57	--	--	--	57
Bur oak	1,467	47	102	148	1,170	--	--	--	--	--
Total	2,573	146	158	405	1,864	57	--	--	--	57
Elm-ash-cottonwood										
Cottonwood	2,337	--	45	2,162	130	342	--	--	342	--
Elm-ash-cottonwood	1,417	--	55	1,113	249	1,758	--	--	1,587	171
Willow	-96	--	--	-96	--	286	--	--	286	--
Total	3,658	--	100	3,179	379	2,386	--	--	2,215	171
Maple-beech-birch										
Maple-basswood	1,753	--	35	1,224	494	360	--	--	233	127
Total	1,753	--	35	1,224	494	360	--	--	233	127
Elm-ash-locust										
Elm-ash-locust	2,285	46	227	1,094	918	324	--	--	219	105
Total	2,285	46	227	1,094	918	324	--	--	219	105
All hardwood types	10,269	192	520	5,902	3,655	3,127	--	--	2,667	460
Nonstocked	-68	-68	--	--	--	392	392	--	--	--
All forest types	14,275	2,492	1,688	6,202	3,893	6,588	2,765	249	2,929	645
Forest type group by local type	Average annual net growth of sawtimber					Average annual removals of sawtimber				
	Major species group					Major species group				
	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods	All species	Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	(In thousand board feet) ¹					(In thousand board feet) ¹				
Softwood type groups										
Ponderosa pine	9,163	9,150	--	--	13	11,182	11,182	--	--	--
Total	9,163	9,150	--	--	13	11,182	11,182	--	--	--
Eastern redcedar										
Eastern redcedar	2,177	131	1,544	402	100	2,053	--	489	1,285	279
Eastern redcedar-hardwood	2,238	45	466	955	772	--	--	--	--	--
Total	4,415	176	2,010	1,357	872	2,053	--	489	1,285	279
All softwood types	13,578	9,326	2,010	1,357	885	13,235	11,182	489	1,285	279
Hardwood type groups										
Oak-hickory										
Oak-hickory	5,927	468	--	1,205	4,254	195	--	--	--	195
Bur oak	5,890	319	678	636	4,257	--	--	--	--	--
Total	11,817	787	678	1,841	8,511	195	--	--	--	195
Elm-ash-cottonwood										
Cottonwood	16,203	--	417	15,533	253	1,497	--	--	1,497	--
Elm-ash-cottonwood	7,060	--	145	6,699	216	8,699	--	--	8,122	577
Willow	-165	--	--	-165	--	1,082	--	--	1,082	--
Total	23,098	--	562	22,067	469	11,278	--	--	10,701	577
Maple-basswood										
Maple basswood	7,737	2	124	5,716	1,895	1,268	--	--	646	622
Total	7,737	2	124	5,716	1,895	1,268	--	--	646	622
Elm-ash-locust										
Elm-ash-locust	10,123	193	1,721	5,068	3,141	1,445	--	--	909	536
Total	10,123	193	1,721	5,068	3,141	1,445	--	--	909	536
All hardwood types	52,775	982	3,085	34,692	14,016	14,186	--	--	12,256	1,930
Nonstocked	-78	-78	--	--	--	2,046	2,046	--	--	--
All forest types	66,275	10,230	5,095	36,049	14,901	29,467	13,228	489	13,541	2,209

¹ International 1/4-inch rule.

Table 26. -- All live aboveground tree biomass on timberland by ownership class,
major species group, and tree biomass component, Nebraska, 1994

(In green tons)

Ownership class and major species group	All components	Tree biomass component						
		All live 1-5 inch trees	Growing-stock trees			Nongrowing-stock trees		
			Stumps	Boles	Tops and limbs	Stumps	Boles	Tops and limbs
National forest								
Pine	2,024,142	66,455	101,851	1,377,553	149,866	24,773	272,088	31,556
Other softwoods	1,834	1,834	--	--	--	--	--	--
Soft hardwoods	65,540	--	--	--	--	3,659	48,286	13,595
Total	2,091,516	68,289	101,851	1,377,553	149,866	28,432	320,374	45,151
Other federal								
Soft hardwoods	139,415	--	9,996	98,620	30,799	--	--	--
Total	139,415	--	9,996	98,620	30,799	--	--	--
State								
Pine	640,363	8,524	30,949	449,924	47,888	6,641	86,698	9,739
Other softwoods	145,262	33,863	5,018	39,628	12,792	4,575	37,636	11,750
Soft hardwoods	1,848,407	26,678	92,119	1,186,333	307,231	14,647	174,185	47,214
Hard hardwoods	505,292	28,007	18,216	199,609	62,992	14,116	135,950	46,402
Total	3,139,324	97,072	146,302	1,875,494	430,903	39,979	434,469	115,105
County and municipal								
Pine	106,107	--	7,167	85,214	8,988	617	3,552	569
Other softwoods	5,891	5,891	--	--	--	--	--	--
Soft hardwoods	249,911	476	13,229	156,210	43,774	2,500	25,747	7,975
Hard hardwoods	23,057	3,034	1,606	13,166	5,251	--	--	--
Total	384,966	9,401	22,002	254,590	58,013	3,117	29,299	8,544
Indian								
Other softwoods	1,187	64	--	--	--	102	760	261
Soft hardwoods	940,181	115,017	32,440	386,354	108,041	18,435	218,680	61,214
Hard hardwoods	491,754	8,261	18,852	198,115	62,820	12,823	148,451	42,432
Total	1,433,122	123,342	51,292	584,469	170,861	31,360	367,891	103,907
Corporate								
Pine	225,356	3,279	11,964	179,318	19,085	873	9,635	1,202
Other softwoods	50,265	14,397	2,471	19,988	6,053	600	5,246	1,510
Soft hardwoods	741,543	6,367	26,429	327,143	85,572	16,914	224,050	55,068
Hard hardwoods	266,989	25,913	3,616	32,643	11,360	13,841	136,396	43,220
Total	1,284,153	49,956	44,480	559,092	122,070	32,228	375,327	101,000
Individual								
Pine	3,262,322	105,905	181,207	2,198,507	241,348	44,221	439,790	51,344
Other softwoods	2,020,721	371,500	117,079	960,404	292,710	23,257	197,675	58,096
Soft hardwoods	25,872,388	1,443,442	878,425	10,967,639	2,837,695	631,020	7,089,462	2,024,705
Hard hardwoods	17,063,025	617,662	538,541	6,328,999	1,834,726	493,344	5,606,298	1,643,455
Total	48,218,456	2,538,509	1,715,252	20,455,549	5,206,479	1,191,842	13,333,225	3,777,600
All ownerships								
Pine	6,258,290	184,163	333,138	4,290,516	467,175	77,125	811,763	94,410
Other softwoods	2,225,160	427,549	124,568	1,020,020	311,555	28,534	241,317	71,617
Soft hardwoods	29,857,385	1,591,980	1,052,638	13,122,299	3,413,112	687,175	7,780,410	2,209,771
Hard hardwoods	18,350,117	682,877	580,831	6,772,532	1,977,149	534,124	6,027,095	1,775,509
Total	56,690,952	2,886,569	2,091,175	25,205,367	6,168,991	1,326,958	14,860,585	4,151,307

Table 27. -- Area of land by land class, forest type, and Forest Survey Unit, Nebraska, 1983 and 1994

(In thousand acres)

Land class and forest type	All Units		Eastern Unit		Western Unit	
	1983	1994	1983	1994	1983	1994
Forest land						
Timberland						
Ponderosa pine	156.8	174.0	--	2.4	156.8	171.6
Eastern redcedar	24.4	52.0	16.2	25.0	8.2	27.0
Eastern redcedar-hardwood	43.9	57.9	14.5	24.4	29.4	33.5
Bur oak	44.2	75.3	28.9	43.4	15.3	31.9
Oak-hickory	50.5	37.7	40.1	30.5	10.4	7.2
Cottonwood	109.2	102.7	79.9	67.2	29.3	35.5
Elm-ash-cottonwood	67.4	98.1	52.7	91.3	14.7	6.8
Willow	5.8	5.0	0.0	3.3	5.8	1.7
Maple-basswood	32.1	80.9	31.5	73.3	0.6	7.6
Elm-ash-locust	102.4	203.3	84.5	177.9	17.9	25.4
Nonstocked	4.8	11.5	4.8	1.7	--	9.8
Total	641.5	898.4	353.1	540.4	288.4	358.0
Reserved forest land	5.3	31.7	2.1	7.8	3.2	23.9
Other forest land	71.5	17.6	26.7	--	44.8	17.6
All forest land	718.3	947.7	381.9	548.2	336.4	399.5
Nonforest land						
Nonforest with trees						
Cropland with trees	41.8	52.7	31.5	34.1	10.3	18.6
Improved pasture with trees	582.5	616.8	221.6	334.9	360.9	281.9
Wooded strips	262.2	179.4	159.0	130.9	103.2	48.5
Idle farmland with trees	--	26.7	--	12.8	--	13.9
Marsh with trees	7.8	5.7	2.3	3.1	5.5	2.6
Urban and other with trees	--	96.8	--	92.3	--	4.5
Windbreaks	139.1	158.4	90.8	97.2	48.3	61.2
Wooded pasture	78.3	117.0	35.2	63.3	43.1	53.7
Total	1,111.7	1,253.5	540.4	768.6	571.3	484.9
Nonforest without trees						
Cropland	25,484.7	22,694.5	16,515.9	14,403.4	8,968.8	8,291.1
Improved pasture	20,246.0	23,181.2	3,921.5	5,863.7	16,324.5	17,317.5
Idle farmland	3.5	745.3	--	444.1	3.5	301.2
Marsh	191.4	160.0	37.4	21.1	154.0	138.9
Other farm-farmstead	123.2	196.3	85.5	150.3	37.7	46.0
Urban and other	1,126.6	153.4	820.4	142.0	306.2	11.4
Noncensus water	46.8	175.3	30.1	56.1	16.7	119.2
Total	47,222.2	47,306.0	21,410.8	21,080.7	25,811.4	26,225.3
All nonforest land	48,333.9	48,559.5	21,951.2	21,849.3	26,382.7	26,710.2
Total land	49,052.2	49,507.2	22,333.1	22,397.5	26,719.1	27,109.7

Table 28. -- Area of timberland by Forest Survey Unit, Nebraska, 1983 and 1994

(In thousand acres)

Forest Survey Unit	1983	1994
Eastern Unit	353.1	540.4
Western Unit	288.4	358.0
Total	641.5	898.4

Table 29. -- Area of timberland by Forest Survey Unit and stand-size class, Nebraska, 1983 and 1994

(In thousand acres)

Forest Survey Unit and stand-size class	1983	1994
Eastern Unit		
Sawtimber	235.3	313.4
Poletimber	72.4	159.1
Sapling & seedling	40.6	66.2
Nonstocked	4.8	1.7
Total	353.1	540.4
Western Unit		
Sawtimber	189.1	231.8
Poletimber	76.3	79.8
Sapling & seedling	23.0	36.6
Nonstocked	- -	9.8
Total	288.4	358.0
All Units		
Sawtimber	424.4	545.2
Poletimber	148.7	238.9
Sapling & seedling	63.6	102.8
Nonstocked	4.8	11.5
Total	641.5	898.4

Table 30. -- Area of timberland by forest type, stand-size class, and ownership class, Nebraska, 1994

(In thousand acres)

Forest type and stand-size class	All ownerships	National forest	Other federal	State	County and municipal	Indian	Corporate	Individual
Ponderosa pine								
Sawtimber	144.1	41.0	--	11.2	2.9	--	2.7	86.3
Poletimber	14.8	5.9	--	2.1	--	--	1.1	5.7
Sapling & seedling	15.1	--	--	--	--	--	--	15.1
Total	174.0	46.9	--	13.3	2.9	--	3.8	107.1
Eastern redcedar								
Sawtimber	3.0	--	--	--	--	--	--	3.0
Poletimber	24.1	--	--	--	--	--	--	24.1
Sapling & seedling	24.9	--	--	1.7	--	--	--	23.2
Total	52.0	--	--	1.7	--	--	--	50.3
Eastern recedar-hardwood								
Sawtimber	33.6	--	--	--	--	--	3.3	30.3
Poletimber	19.2	--	--	5.7	--	--	0.8	12.7
Sapling & seedling	5.1	--	--	--	--	--	--	5.1
Total	57.9	--	--	5.7	--	--	4.1	48.1
Bur oak								
Sawtimber	27.7	--	--	--	--	0.2	1.4	26.1
Poletimber	47.6	--	--	--	--	1.3	0.6	45.7
Total	75.3	--	--	--	--	1.5	2.0	71.8
Oak-hickory								
Sawtimber	27.2	--	--	--	--	1.7	--	25.5
Poletimber	10.5	--	--	--	--	--	1.9	8.6
Total	37.7	--	--	--	--	1.7	1.9	34.1
Cottonwood								
Sawtimber	91.7	--	1.6	13.4	1.2	1.0	8.2	66.3
Poletimber	5.6	--	--	1.5	--	--	--	4.1
Sapling & seedling	5.4	--	--	--	--	1.9	--	3.5
Total	102.7	--	1.6	14.9	1.2	2.9	8.2	73.9
Elm-ash-cottonwood								
Sawtimber	73.7	--	--	3.6	--	--	1.0	69.1
Poletimber	9.8	--	--	--	0.9	--	--	8.9
Sapling & seedling	14.6	--	--	2.9	--	--	--	11.7
Total	98.1	--	--	6.5	0.9	--	1.0	89.7
Willow								
Poletimber	2.6	--	--	--	--	--	--	2.6
Sapling & seedling	2.4	--	--	--	--	--	--	2.4
Total	5.0	--	--	--	--	--	--	5.0
Maple-basswood								
Sawtimber	50.0	--	--	--	--	6.7	--	43.3
Poletimber	26.9	--	--	--	--	2.1	--	24.8
Sapling & seedling	4.0	--	--	--	--	0.4	--	3.6
Total	80.9	--	--	--	--	9.2	--	71.7
Elm-ash-locust								
Sawtimber	94.2	--	--	2.8	--	0.9	--	90.5
Poletimber	77.8	--	--	0.7	--	1.0	--	76.1
Sapling & seedling	31.3	--	--	4.1	3.6	--	--	23.6
Total	203.3	--	--	7.6	3.6	1.9	--	190.2
Nonstocked	11.5	--	--	--	1.1	--	--	10.4
All types								
Sawtimber	545.2	41.0	1.6	31.0	4.1	10.5	16.6	440.4
Poletimber	238.9	5.9	--	10.0	0.9	4.4	4.4	213.3
Sapling & seedling	102.8	--	--	8.7	3.6	2.3	--	88.2
Nonstocked	11.5	--	--	--	1.1	--	--	10.4
Total	898.4	46.9	1.6	49.7	9.7	17.2	21.0	752.3

Table 31. -- Area of timberland by forest type, stand-size class, and potential productivity class, Nebraska, 1994

(In thousand acres)

Forest type and stand-size class	All classes	Potential productivity class (cubic feet of growth per acre per year)			
		120+	85-119	50-84	20-49
Ponderosa pine					
Sawtimber	144.1	2.0	31.9	31.0	79.2
Poletimber	14.8	--	--	2.1	12.7
Sapling & seedling	15.1	--	1.8	--	13.3
Total	174.0	2.0	33.7	33.1	105.2
Eastern redcedar					
Sawtimber	3.0	--	--	--	3.0
Poletimber	24.1	--	4.9	2.7	16.5
Sapling & seedling	24.9	2.6	8.4	2.5	11.4
Total	52.0	2.6	13.3	5.2	30.9
Eastern redcedar-hardwood					
Sawtimber	33.6	1.9	5.2	5.5	21.0
Poletimber	19.2	--	4.3	6.5	8.4
Sapling & seedling	5.1	--	3.3	--	1.8
Total	57.9	1.9	12.8	12.0	31.2
Bur oak					
Sawtimber	27.7	--	4.1	2.4	21.2
Poletimber	47.6	--	13.7	5.9	28.0
Total	75.3	--	17.8	8.3	49.2
Oak-hickory					
Sawtimber	27.2	--	2.6	14.1	10.5
Poletimber	10.5	--	4.1	2.3	4.1
Total	37.7	--	6.7	16.4	14.6
Cottonwood					
Sawtimber	91.7	3.1	19.5	43.7	25.4
Poletimber	5.6	--	1.8	--	3.8
Sapling & seedling	5.4	--	--	1.9	3.5
Total	102.7	3.1	21.3	45.6	32.7
Elm-ash-cottonwood					
Sawtimber	73.7	1.6	22.7	28.7	20.7
Poletimber	9.8	1.8	0.9	2.4	4.7
Sapling & seedling	14.6	2.0	2.0	7.5	3.1
Total	98.1	5.4	25.6	38.6	28.5
Willow					
Poletimber	2.6	--	--	--	2.6
Sapling & seedling	2.4	0.7	--	--	1.7
Total	5.0	0.7	--	--	4.3
Maple-basswood					
Sawtimber	50.0	--	13.0	14.8	22.2
Poletimber	26.9	--	--	18.8	8.1
Sapling & seedling	4.0	--	--	--	4.0
Total	80.9	--	13.0	33.6	34.3
Elm-ash-locust					
Sawtimber	94.2	2.6	23.0	26.9	41.7
Poletimber	77.8	2.3	2.6	30.5	42.4
Sapling & seedling	31.3	2.9	2.8	17.5	8.1
Total	203.3	7.8	28.4	74.9	92.2
Nonstocked	11.5	--	0.2	1.7	9.6
All types					
Sawtimber	545.2	11.2	122.0	167.1	244.9
Poletimber	238.9	4.1	32.3	71.2	131.3
Sapling & seedling	102.8	8.2	18.3	29.4	46.9
Nonstocked	11.5	--	0.2	1.7	9.6
Total	898.4	23.5	172.8	269.4	432.7

Table 32. -- Area of timberland by forest type, basal-area class, and stand-size class, Nebraska, 1994

(In thousand acres)

Forest type and stand-size class	All classes	Basal-area class (square feet per acre)													
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-120	121-150	151-180	181+
Ponderosa pine															
Sawtimber	144.1	--	3.1	17.3	4.4	17.1	18.2	21.9	19.6	8.1	11.1	16.5	6.8	--	--
Poletimber	14.8	--	1.1	--	--	--	2.8	0.8	--	3.1	2.1	2.8	2.1	--	--
Sapling and seedling	15.1	2.4	7.3	2.9	2.5	--	--	--	--	--	--	--	--	--	--
Total	174.0	2.4	11.5	20.2	6.9	17.1	21.0	22.7	19.6	11.2	13.2	19.3	8.9	--	--
Eastern redcedar															
Sawtimber	3.0	0.5	--	0.7	--	--	--	--	--	--	--	1.8	--	--	--
Poletimber	24.1	--	--	--	--	--	3.6	1.8	6.3	8.0	2.2	2.2	--	--	--
Sapling and seedling	24.9	--	2.5	9.8	3.3	7.5	--	--	--	1.8	--	--	--	--	--
Total	52.0	0.5	2.5	10.5	3.3	7.5	3.6	1.8	6.3	9.8	2.2	4.0	--	--	--
Eastern redcedar-hardwood															
Sawtimber	33.6	--	--	--	--	2.5	3.5	4.4	1.6	6.6	--	9.1	2.0	1.9	2.0
Poletimber	19.2	--	--	--	2.0	4.3	--	--	2.2	2.4	1.8	4.4	2.1	--	--
Sapling and seedling	5.1	--	--	1.5	--	1.8	1.8	--	--	--	--	--	--	--	--
Total	57.9	--	--	1.5	2.0	8.6	5.3	4.4	3.8	9.0	1.8	13.5	4.1	1.9	2.0
Bur oak															
Sawtimber	27.7	--	--	0.7	1.4	1.4	--	--	4.2	2.2	5.0	5.8	7.0	--	--
Poletimber	47.6	0.1	--	--	0.2	0.6	2.2	0.8	20.2	4.1	2.6	8.9	5.2	2.7	--
Total	75.3	0.1	--	0.7	1.6	2.0	2.2	0.8	24.4	6.3	7.6	14.7	12.2	2.7	--
Oak-hickory															
Sawtimber	27.2	--	0.2	--	--	2.6	0.7	--	1.4	4.6	6.9	1.7	6.8	2.3	--
Poletimber	10.5	--	--	--	--	1.9	--	--	1.6	2.2	--	2.3	2.5	--	--
Total	37.7	--	0.2	--	--	4.5	0.7	--	3.0	6.8	6.9	4.0	9.3	2.3	--
Cottonwood															
Sawtimber	91.7	0.8	1.6	--	3.5	13.4	--	9.3	6.1	3.7	3.3	20.7	7.6	11.8	9.9
Poletimber	5.6	--	--	--	--	--	--	--	4.1	--	--	1.5	--	--	--
Sapling and seedling	5.4	--	3.5	--	--	1.9	--	--	--	--	--	--	--	--	--
Total	102.7	0.8	5.1	--	3.5	15.3	--	9.3	10.2	3.7	3.3	22.2	7.6	11.8	9.9
Elm-ash-cottonwood															
Sawtimber	73.7	0.2	--	1.9	1.7	5.5	2.1	4.2	1.5	5.8	7.7	16.6	13.0	4.9	8.6
Poletimber	9.8	0.4	0.9	--	--	1.0	--	0.9	2.3	4.3	--	--	--	--	--
Sapling and seedling	14.6	4.9	2.0	1.5	--	--	2.2	2.0	--	--	--	--	--	--	2.0
Total	98.1	5.5	2.9	3.4	1.7	6.5	4.3	7.1	3.8	10.1	7.7	16.6	13.0	4.9	10.6
Willow															
Poletimber	2.6	--	2.6	--	--	--	--	--	--	--	--	--	--	--	--
Sapling and seedling	2.4	0.7	--	1.7	--	--	--	--	--	--	--	--	--	--	--
Total	5.0	0.7	2.6	1.7	--	--	--	--	--	--	--	--	--	--	--
Maple-basswood															
Sawtimber	50.0	1.7	--	3.5	--	--	--	3.2	--	10.0	1.1	2.6	23.9	3.6	0.4
Poletimber	26.9	1.9	0.7	--	--	1.5	--	4.8	--	1.4	2.6	14.0	--	--	--
Sapling and seedling	4.0	0.2	2.3	1.1	--	0.4	--	--	--	--	--	--	--	--	--
Total	80.9	3.8	3.0	4.6	--	1.9	--	8.0	--	11.4	3.7	16.6	23.9	3.6	0.4
Elm-ash-locust															
Sawtimber	94.2	3.0	5.9	3.9	7.5	13.4	2.0	2.6	14.8	5.7	3.8	12.0	7.5	6.3	5.8
Poletimber	77.8	0.7	5.0	25.7	0.8	4.5	11.0	10.3	4.8	1.1	5.0	6.8	2.1	--	--
Sapling and seedling	31.3	7.7	7.0	6.4	1.7	1.6	--	0.6	2.9	--	1.7	1.7	--	--	--
Total	203.3	11.4	17.9	36.0	10.0	19.5	13.0	13.5	22.5	6.8	10.5	20.5	9.6	6.3	5.8
Nonstocked	11.5	4.2	7.3	--	--	--	--	--	--	--	--	--	--	--	--
All types															
Sawtimber	545.2	6.2	10.8	28.0	18.5	55.9	26.5	45.6	49.2	46.7	38.9	86.8	74.6	30.8	26.7
Poletimber	238.9	3.1	10.3	25.7	3.0	13.8	19.6	19.4	41.5	26.6	16.3	42.9	14.0	2.7	--
Sapling and seedling	102.8	15.9	24.6	24.9	7.5	13.2	4.0	2.6	2.9	1.8	1.7	1.7	--	--	2.0
Nonstocked	11.5	4.2	7.3	--	--	--	--	--	--	--	--	--	--	--	--
Total	898.4	29.4	53.0	78.6	29.0	82.9	50.1	67.6	93.6	75.1	56.9	131.4	88.6	33.5	28.7

Table 33. -- Net volume of growing stock on timberland by species group and Forest Survey Unit, Nebraska, 1983 and 1994

(In thousand cubic feet)

Species group	Forest Survey Unit					
	All Units		Eastern Unit		Western Unit	
	1983	1994	1983	1994	1983	1994
Softwoods						
Ponderosa pine	142,867	166,949	--	2,103	142,867	164,846
Eastern redcedar	16,211	42,277	10,521	26,478	5,690	15,799
Other softwoods	--	133	--	--	--	133
Total softwoods	159,078	209,359	10,521	28,581	148,557	180,778
Hardwoods						
Select white oak	54,502	104,192	39,121	78,606	15,381	25,586
Other white oak	229	--	229	--	--	--
Select red oak	5,248	13,372	5,248	13,372	--	--
Other red oak	649	2,434	649	2,434	--	--
Select hickory	3,014	1,809	3,014	1,809	--	--
Other hickory	1,790	3,420	1,790	3,420	--	--
Basswood	8,858	26,545	7,794	25,373	1,064	1,172
Silver maple	7,258	11,563	7,258	11,563	--	--
Elm	16,195	37,071	13,655	32,174	2,540	4,897
White & green ash	40,739	57,041	30,705	42,028	10,034	15,013
Cottonwood	226,600	306,432	163,980	203,634	62,620	102,798
Willow	16,233	13,808	11,312	11,461	4,921	2,347
Hackberry	20,587	33,746	19,012	31,549	1,575	2,197
Black cherry	--	518	--	518	--	--
Black walnut	8,407	13,852	8,072	12,863	335	989
Other hardwoods	17,942	19,229	16,770	18,226	1,172	1,003
Total hardwoods	428,251	645,032	328,609	489,030	99,642	156,002
All species	587,329	854,391	339,130	517,611	248,199	336,780

Table 34. -- Net volume of sawtimber on timberland by species group and Forest Survey Unit, Nebraska, 1983 and 1994

(In thousand board feet) ¹

Species group	All Units		Forest Survey Unit			
			Eastern Unit		Western Unit	
	1983	1994	1983	1994	1983	1994
Softwoods						
Ponderosa pine	579,120	710,626	--	7,763	579,120	702,863
Eastern redcedar	27,815	94,836	15,598	64,660	12,217	30,176
Total softwoods	606,935	805,462	15,598	72,423	591,337	733,039
Hardwoods						
Select white oak	179,389	406,087	137,791	334,282	41,598	71,805
Other white oak	1,108	--	1,108	--	--	--
Select red oak	20,302	48,532	20,302	48,532	--	--
Other red oak	1,042	4,619	1,042	4,619	--	--
Select hickory	3,018	3,349	3,018	3,349	--	--
Other hickory	3,262	6,542	3,262	6,542	--	--
Basswood	40,351	106,473	35,640	101,065	4,711	5,408
Silver maple	14,655	41,611	14,655	41,611	--	--
Elm	17,158	60,078	16,107	53,408	1,051	6,670
White & green ash	138,577	179,341	114,313	135,311	24,264	44,030
Cottonwood	981,021	1,447,752	688,205	953,248	292,816	494,504
Willow	43,366	49,525	31,515	42,786	11,851	6,739
Hackberry	58,273	103,644	56,090	96,895	2,183	6,749
Black walnut	19,890	39,706	18,707	35,274	1,183	4,432
Other hardwoods	48,548	57,350	47,271	53,459	1,277	3,891
Total hardwoods	1,569,960	2,554,609	1,189,026	1,910,381	380,934	644,228
All species	2,176,895	3,360,071	1,204,624	1,982,804	972,271	1,377,267

¹ International 1/4-inch rule.

Table 35. -- Net volume of all live trees¹ greater than 5 inches in diameter at breast height on timberland by species group and diameter class, Nebraska, 1994

(In thousand cubic feet)

Species group	All	Diameter class (inches at breast height)									
	classes	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods											
Ponderosa pine	197,970	10,542	17,167	28,857	35,001	31,749	30,325	22,995	11,658	9,676	--
Eastern redcedar	51,316	13,253	14,383	11,212	5,616	4,962	652	578	383	277	--
Other softwoods	836	133	--	445	258	--	--	--	--	--	--
Total softwoods	250,122	23,928	31,550	40,514	40,875	36,711	30,977	23,573	12,041	9,953	--
Hardwoods											
Select white oak	207,779	11,872	15,381	26,105	25,905	19,168	25,549	19,591	13,720	33,426	17,062
Select red oak	15,534	78	1,315	2,456	1,725	2,619	1,883	1,078	547	2,213	1,620
Other red oak	3,178	513	--	948	311	806	232	368	--	--	--
Select hickory	2,144	237	489	585	332	--	--	301	--	200	--
Other hickory	4,674	321	1,334	864	1,240	--	605	--	310	--	--
Basswood	38,359	3,310	1,978	2,703	4,556	5,591	6,379	4,265	3,575	4,765	1,237
Silver maple	22,813	185	1,664	2,476	2,815	1,885	2,263	2,369	2,087	4,654	2,415
Elm	88,109	13,792	15,488	16,341	18,187	8,404	6,918	4,520	1,915	2,544	--
White & green ash	102,269	8,345	13,517	11,279	12,848	13,188	11,429	11,008	4,444	14,604	1,607
Cottonwood	365,496	3,765	8,188	9,089	17,617	19,073	27,292	33,693	35,823	112,632	98,324
Willow	23,337	577	1,062	2,010	2,994	4,328	4,144	2,861	2,312	3,049	--
Hackberry	56,068	4,504	6,257	7,527	5,311	8,478	5,065	3,269	2,952	8,263	4,442
Black cherry	1,478	--	236	1,077	165	--	--	--	--	--	--
Black walnut	20,702	1,193	1,309	4,066	2,678	3,620	2,084	3,033	1,782	937	--
Other hardwoods	89,802	8,746	9,247	10,175	12,474	12,023	8,886	8,891	7,658	11,026	676
Total hardwoods	1,041,742	57,438	77,465	97,701	109,158	99,183	102,729	95,247	77,125	198,313	127,383
Noncommercial spp.	10,390	2,873	2,145	2,511	394	363	--	--	1,876	228	--
All species	1,302,254	84,239	111,160	140,726	150,427	136,257	133,706	118,820	91,042	208,494	127,383

¹ Net volume of all live trees 5 inches d.b.h. and larger from a 1-foot stump to a 4-inch top diameter outside bark.

Table 36. -- Net volume of tree species on timberland by major tree class and individual species, Nebraska, 1994.

Individual species	Major tree class							
	All live	All live trees				Saw-log size trees		
		Growing stock	Short-log	Rough	Rotten	All saw-log size trees	Sawtimber	Short-log
(In thousand cubic feet)				(In thousand board feet) ¹				
Softwoods								
Ponderosa pine	197,970	166,949	7,474	22,004	1,543	746,334	710,626	35,708
Eastern redcedar	51,316	42,277	1,281	7,590	168	100,009	94,836	5,173
Rocky Mountain juniper	836	133	--	703	--	--	--	--
Total softwoods	250,122	209,359	8,755	30,297	1,711	846,343	805,462	40,881
Hardwoods								
Bur oak	205,080	102,546	22,050	78,815	1,669	495,566	399,397	96,169
Chinkapin oak	2,699	1,646	--	1,053	--	6,690	6,690	--
Northern red oak	15,534	13,372	1,066	618	478	52,778	48,532	4,246
Black oak	3,178	2,434	650	--	94	7,135	4,619	2,516
Pecan	467	301	--	166	--	1,509	1,509	--
Shagbark hickory	1,677	1,508	169	--	--	2,441	1,840	601
Bitternut hickory	4,674	3,420	530	646	78	8,557	6,542	2,015
American basswood	38,359	26,545	5,450	2,738	3,626	125,791	106,473	19,318
Silver maple	22,813	11,563	1,825	8,650	775	48,712	41,611	7,101
American elm	63,609	25,663	6,577	31,313	56	69,299	40,681	28,618
Siberian elm	11,236	3,933	2,740	4,506	57	18,280	6,479	11,801
Slippery elm	13,045	7,475	907	4,663	--	16,850	12,918	3,932
Rock elm	219	--	--	219	--	--	--	--
Green ash	102,269	57,041	9,304	33,254	2,670	219,280	179,341	39,939
Sycamore	2,103	2,103	--	--	--	11,303	11,303	--
Eastern cottonwood	365,496	306,432	20,527	26,972	11,565	1,521,185	1,447,752	73,433
Black willow	23,337	13,808	2,089	5,574	1,866	56,240	49,525	6,715
Hackberry	56,068	33,746	4,632	16,726	964	122,034	103,644	18,390
Paper birch	376	302	--	74	--	935	935	--
Black cherry	1,478	518	--	855	105	--	--	--
Black walnut	20,702	13,852	2,442	3,811	597	48,084	39,706	8,378
Boxelder	39,936	5,511	2,981	24,580	6,864	29,116	17,836	11,280
Northern catalpa	146	--	--	--	146	--	--	--
Kentucky coffeetree	2,792	2,321	--	471	--	7,996	7,996	--
Honeylocust	12,037	5,580	1,677	4,388	392	19,766	13,485	6,281
White mulberry	26,401	2,869	1,432	20,332	1,768	10,215	4,830	5,385
Red mulberry	4,831	367	2,108	1,403	953	8,712	230	8,482
Black locust	1,180	176	--	1,004	--	735	735	--
Total hardwoods	1,041,742	645,032	89,156	272,831	34,723	2,909,209	2,554,609	354,600
Noncommercial species	10,390	--	--	9,953	437	--	--	--
All species	1,302,254	854,391	97,911	313,081	36,871	3,755,552	3,360,071	395,481

¹ International 1/4-inch rule.

Table 37. -- Net volume of noncommercial tree species
on timberland by individual species, Nebraska, 1994

(In thousand cubic feet)

Noncommercial tree species	Non-growing-stock volume
Osage-orange	4,003
Eastern hophornbeam	3,707
Chokecherry	94
Diamond willow	825
Eastern redbud	1,761
All noncommercial species	10,390

Table 38. -- Net volume of growing stock on timberland by species group and forest type, Nebraska, 1994

(In thousand cubic feet)

		Forest type										
	All	Ponderosa	Eastern	Eastern	Bur	Oak-		Elm-ash-		Maple-	Elm-ash-	Non-
Species group	types	pine	redcedar	redcedar-	oak	hickory	Cottonwood	cottonwood	Willow	basswood	locust	stocked
Softwoods												
Ponderosa pine	166,949	148,809	3,369	2,390	4,113	4,467	--	--	--	--	2,366	1,435
Eastern redcedar	42,277	533	15,562	15,198	2,360	476	2,487	1,011	--	1,175	3,475	--
Other softwoods	133	133	--	--	--	--	--	--	--	--	--	--
Total softwoods	209,359	149,475	18,931	17,588	6,473	4,943	2,487	1,011	--	1,175	5,841	1,435
Hardwoods												
Select white oak	104,192	388	592	5,289	43,340	18,169	--	1,070	--	18,861	16,483	--
Select red oak	13,372	--	--	1,027	1,384	8,671	--	--	--	1,803	487	--
Other red oak	2,434	--	--	--	1,290	1,144	--	--	--	--	--	--
Select hickory	1,809	--	--	--	--	1,372	--	--	--	74	363	--
Other hickory	3,420	--	--	--	59	2,333	--	--	--	797	231	--
Basswood	26,545	--	--	1,076	427	2,241	--	543	--	20,984	1,274	--
Silver maple	11,563	--	--	--	--	--	578	6,242	--	--	4,743	--
Elm	37,071	--	875	202	2,158	1,714	2,659	8,243	--	3,696	17,524	--
White & green ash	57,041	--	1,240	2,433	2,924	889	2,845	19,049	--	6,362	21,299	--
Cottonwood	306,432	--	1,341	23,530	--	1,422	208,498	39,409	371	8,833	23,028	--
Willow	13,808	--	365	93	--	--	1,846	4,939	479	467	5,619	--
Hackberry	33,746	--	415	435	1,377	2,992	--	8,030	--	12,912	7,585	--
Black cherry	518	--	--	--	--	--	--	146	--	372	--	--
Black walnut	13,852	--	--	107	384	802	--	1,352	--	5,442	5,765	--
Other hardwoods	19,229	--	76	552	163	2,400	388	6,847	--	1,284	7,519	--
Total hardwoods	645,032	388	4,904	34,744	53,506	44,149	216,814	95,870	850	81,887	111,920	--
All species	854,391	149,863	23,835	52,332	59,979	49,092	219,301	96,881	850	83,062	117,761	1,435

Table 39. -- Net volume of sawtimber on timberland by species group and forest type, Nebraska, 1994

(In thousand board feet) ¹

		Forest type										
				Eastern								
Species group	All types	Ponderosa pine	Eastern redcedar	redcedar-hardwood	Bur oak	Oak-hickory	Cottonwood	Elm-ash-cottonwood	Willow	Maple-basswood	Elm-ash-locust	Non-stocked
Softwoods												
Ponderosa pine	710,626	631,949	14,457	10,363	16,449	21,514	--	--	--	--	9,051	6,843
Eastern redcedar	94,836	700	30,748	41,947	3,252	--	4,643	3,558	--	4,781	5,207	--
Total softwoods	805,462	632,649	45,205	52,310	19,701	21,514	4,643	3,558	--	4,781	14,258	6,843
Hardwoods												
Select white oak	406,087	657	1,280	11,826	136,571	80,458	--	4,799	--	90,139	80,357	--
Select red oak	48,532	--	--	5,379	738	36,397	--	--	--	3,515	2,503	--
Other red oak	4,619	--	--	--	1,637	2,982	--	--	--	--	--	--
Select hickory	3,349	--	--	--	--	1,509	--	--	--	--	1,840	--
Other hickory	6,542	--	--	--	--	4,782	--	--	--	1,760	--	--
Basswood	106,473	--	--	4,681	417	10,260	--	2,593	--	82,061	6,461	--
Silver maple	41,611	--	--	--	--	--	2,528	18,889	--	--	20,194	--
Elm	60,078	--	1,853	--	217	2,777	2,774	18,497	--	4,837	29,123	--
White & green ash	179,341	--	2,777	8,079	6,907	2,281	735	74,948	--	21,540	62,074	--
Cottonwood	1,447,752	--	7,081	112,258	--	7,239	969,044	193,842	1,697	41,602	114,989	--
Willow	49,525	--	1,036	--	--	--	3,422	19,489	1,827	2,085	21,666	--
Hackberry	103,644	--	1,267	1,746	2,915	8,826	--	29,254	--	30,746	28,890	--
Black walnut	39,706	--	--	--	1,335	1,403	--	460	--	21,355	15,153	--
Other hardwoods	57,350	--	--	--	815	5,778	--	24,183	--	3,244	23,330	--
Total hardwoods	2,554,609	657	15,294	143,969	151,552	164,692	978,503	386,954	3,524	302,884	406,580	--
All species	3,360,071	633,306	60,499	196,279	171,253	186,206	983,146	390,512	3,524	307,665	420,838	6,843

¹ International 1/4-inch rule.

Table 40. -- Net volume of short-log trees (cull volume) in cubic feet on timberland by species group and diameter class, Nebraska, 1994

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Ponderosa pine	7,474	2,179	1,745	2,069	930	311	240	--	--
Eastern redcedar	1,281	747	248	286	--	--	--	--	--
Total softwoods	8,755	2,926	1,993	2,355	930	311	240	--	--
Hardwoods									
Select white oak	22,050	--	3,726	3,488	4,472	1,815	2,273	5,162	1,114
Select red oak	1,066	--	76	--	170	--	261	--	559
Other red oak	650	--	--	282	--	368	--	--	--
Select hickory	169	--	169	--	--	--	--	--	--
Other hickory	530	--	122	--	98	--	310	--	--
Basswood	5,450	--	488	888	577	661	1,851	985	--
Silver maple	1,825	--	482	--	231	524	272	316	--
Elm	10,224	--	5,793	2,569	1,046	517	299	--	--
White & green ash	9,304	--	1,082	1,225	1,751	1,490	930	2,826	--
Cottonwood	20,527	--	110	872	1,990	2,474	2,973	9,119	2,989
Willow	2,089	--	460	997	144	488	--	--	--
Hackberry	4,632	--	1,020	1,031	429	1,100	636	416	--
Black walnut	2,442	--	637	453	720	390	242	--	--
Other hardwoods	8,198	--	972	745	1,664	1,493	1,320	2,004	--
Total hardwoods	89,156	--	15,137	12,550	13,292	11,320	11,367	20,828	4,662
All species	97,911	2,926	17,130	14,905	14,222	11,631	11,607	20,828	4,662

Table 41. -- Net volume of short-log trees (cull volume) in board feet¹ on timberland by species group and diameter class, Nebraska, 1994

(In thousand board feet) ¹

Species group	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
Ponderosa pine	35,708	10,008	8,243	9,957	4,714	1,595	1,191	--	--
Eastern redcedar	5,173	3,117	977	1,079	--	--	--	--	--
Total softwoods	40,881	13,125	9,220	11,036	4,714	1,595	1,191	--	--
Hardwoods									
Select white oak	96,169	--	15,591	14,766	19,298	7,889	10,025	23,259	5,341
Select red oak	4,246	--	276	--	656	--	1,032	--	2,282
Other red oak	2,516	--	--	1,064	--	1,452	--	--	--
Select hickory	601	--	601	--	--	--	--	--	--
Other hickory	2,015	--	434	--	366	--	1,215	--	--
Basswood	19,318	--	1,649	3,055	2,012	2,334	6,644	3,624	--
Silver maple	7,101	--	1,747	--	895	2,050	1,092	1,317	--
Elm	44,351	--	25,093	11,041	4,706	2,240	1,271	--	--
White & green ash	39,939	--	4,096	4,877	7,291	6,394	4,099	13,182	--
Cottonwood	73,433	--	338	2,932	6,862	8,615	10,710	33,465	10,511
Willow	6,715	--	1,390	3,161	491	1,673	--	--	--
Hackberry	18,390	--	3,991	3,975	1,738	4,498	2,429	1,759	--
Black walnut	8,378	--	2,063	1,533	2,528	1,378	876	--	--
Other hardwoods	31,428	--	3,471	2,747	6,246	5,681	5,193	8,090	--
Total hardwoods	354,600	--	60,740	49,151	53,089	44,204	44,586	84,696	18,134
All species	395,481	13,125	69,960	60,187	57,803	45,799	45,777	84,696	18,134

¹ International 1/4-inch rule.

Table 42. -- Current annual net growth of growing stock and sawtimber on timberland, 1983 and 1993,
and average annual net growth of growing stock and sawtimber, 1983-1993
by softwoods and hardwoods and Forest Survey Unit, Nebraska

Forest Survey Unit by softwoods and hardwoods	Growing stock			Sawtimber		
	Current annual net growth	Average annual net growth	Current annual net growth	Current annual net growth	Average annual net growth	Current annual net growth
	1983	1983-1993	1993	1983	1983-1993	1993
	<i>(In thousand cubic feet)</i>			<i>(In thousand board feet) ¹</i>		
Eastern Unit						
Softwoods	446	1,243	1,004	856	4,075	4,031
Hardwoods	6,911	8,589	9,861	31,166	43,842	54,052
Total	7,357	9,832	10,865	32,022	47,917	58,083
Western Unit						
Softwoods	2,506	2,937	2,888	11,813	11,250	14,487
Hardwoods	2,135	1,506	2,027	12,059	7,108	10,439
Total	4,641	4,443	4,915	23,872	18,358	24,926
All Units						
Softwoods	2,952	4,180	3,892	12,669	15,325	18,518
Hardwoods	9,046	10,095	11,888	43,225	50,950	64,491
Total	11,998	14,275	15,780	55,894	66,275	83,009

¹ International 1/4-inch rule.

Table 43. -- Average annual net growth of growing stock on timberland by species group and forest type, Nebraska, 1983-1993

(In thousand cubic feet)

		Forest type										
				Eastern								
Species group	All types	Ponderosa pine	Eastern redcedar	redcedar-hardwood	Bur oak	Oak-hickory	Cottonwood	Elm-ash-cottonwood	Willow	Maple-basswood	Elm-ash-locust	Non-stocked
Softwoods												
Ponderosa pine	2,492	2,285	65	18	47	99	--	--	--	--	46	-68
Eastern redcedar	1,678	27	842	289	102	56	45	55	--	35	227	--
Other softwoods	10	10	--	--	--	--	--	--	--	--	--	--
Total softwoods	4,180	2,322	907	307	149	155	45	55	--	35	273	-68
Hardwoods												
Select white oak	1,777	6	18	124	1,004	285	--	-14	--	217	137	--
Other white oak	-14	--	--	--	--	--	--	--	--	--	-14	--
Select red oak	250	--	--	7	68	138	--	--	--	43	-6	--
Other red oak	100	--	--	--	28	72	--	--	--	--	--	--
Select hickory	38	--	--	--	--	31	--	--	--	2	5	--
Other hickory	82	--	--	--	1	44	--	--	--	32	5	--
Basswood	429	--	--	-17	15	58	--	9	--	341	23	--
Silver maple	331	--	--	--	--	--	26	189	--	7	109	--
Elm	1,027	--	63	-15	45	90	-70	207	--	130	577	--
White & green ash	1,050	--	29	44	79	4	130	189	--	77	498	--
Cottonwood	2,787	--	38	122	34	23	2,270	329	-45	3	13	--
Willow	87	--	26	7	--	--	-87	-3	-51	6	189	--
Hackberry	1,463	--	37	28	85	73	--	337	--	698	205	--
Black cherry	38	--	--	--	--	--	--	13	--	25	--	--
Black walnut	289	--	--	7	-10	23	--	67	--	71	131	--
Other hardwoods	361	--	3	11	-31	110	23	39	--	66	140	--
Total hardwoods	10,095	6	214	318	1,318	951	2,292	1,362	-96	1,718	2,012	--
All species	14,275	2,328	1,121	625	1,467	1,106	2,337	1,417	-96	1,753	2,285	-68

Table 44. -- Average annual net growth of sawtimber on timberland by species group and forest type, Nebraska, 1983-1993

(In thousand board feet) ¹

Species group	Forest type											
	All types	Ponderosa pine	Eastern redcedar	Eastern redcedar-hardwood	Bur oak	Oak-hickory	Cottonwood	Elm-ash-cottonwood	Willow	Maple-basswood	Elm-ash-locust	Non-stocked
Softwoods												
Ponderosa pine	10,230	9,150	131	45	319	468	--	--	--	2	193	-78
Eastern redcedar	5,095	--	1,544	466	678	--	417	145	--	124	1,721	--
Total softwoods	15,325	9,150	1,675	511	997	468	417	145	--	126	1,914	-78
Hardwoods												
Select white oak	9,355	13	35	815	4,047	2,162	--	-86	--	1,270	1,099	--
Other white oak	-67	--	--	--	--	--	--	--	--	--	-67	--
Select red oak	1,177	--	--	40	18	1,162	--	--	--	6	-49	--
Other red oak	208	--	--	--	16	192	--	--	--	--	--	--
Select hickory	50	--	--	--	--	36	--	--	--	--	14	--
Other hickory	232	--	--	--	--	209	--	--	--	23	--	--
Basswood	3,708	--	--	-35	187	271	--	188	--	3,070	27	--
Soft maple	1,499	--	--	--	--	--	125	924	--	--	450	--
Elm	3,929	--	8	--	203	323	-66	860	--	210	2,391	--
White & green ash	2,063	--	65	-92	118	38	253	438	--	-24	1,267	--
Cottonwood	19,061	--	191	839	155	200	15,996	1,854	-190	56	-40	--
Willow	1,187	--	95	--	--	--	-522	222	25	34	1,333	--
Hackberry	6,603	--	108	151	145	411	--	2,529	--	2,328	931	--
Black walnut	979	--	--	9	58	26	--	-77	--	339	624	--
Other hardwoods	966	--	--	--	-54	429	--	63	--	299	229	--
Total hardwoods	50,950	13	502	1,727	4,893	5,459	15,786	6,915	-165	7,611	8,209	--
All species	66,275	9,163	2,177	2,238	5,890	5,927	16,203	7,060	-165	7,737	10,123	-78

¹ International 1/4-inch rule.

Table 45. -- Current annual net growth of growing stock on timberland by species group and forest type, Nebraska, 1993

(In thousand cubic feet)

Species group	Forest type											
	All types	Ponderosa pine	Eastern redcedar	Eastern redcedar-hardwood	Bur oak	Oak-hickory	Cottonwood	Elm-ash-cottonwood	Willow	Maple-basswood	Elm-ash-locust	Non-stocked
Softwoods												
Ponderosa pine	2,525	2,264	36	34	54	49	--	--	--	--	44	44
Eastern redcedar	1,357	26	653	270	68	88	-16	42	--	18	208	--
Other softwoods	10	10	--	--	--	--	--	--	--	--	--	--
Total softwoods	3,892	2,300	689	304	122	137	-16	42	--	18	252	44
Hardwoods												
Select white oak	1,803	6	18	139	846	271	--	19	--	276	228	--
Select red oak	298	--	--	4	59	174	--	--	--	53	8	--
Other red oak	67	--	--	--	28	39	--	--	--	--	--	--
Select hickory	22	--	--	--	--	17	--	--	--	2	3	--
Other hickory	52	--	--	--	1	31	--	--	--	17	3	--
Basswood	485	--	--	22	7	29	--	9	--	381	37	--
Silver maple	383	--	--	--	--	--	26	278	--	--	79	--
Elm	615	--	56	1	36	-2	-17	-17	--	2	556	--
White & green ash	1,459	--	41	28	87	22	150	356	--	88	687	--
Cottonwood	3,568	--	21	207	--	31	2,932	253	12	12	100	--
Willow	476	--	22	7	--	--	61	196	27	6	157	--
Hackberry	1,646	--	19	15	91	131	--	251	--	805	334	--
Black cherry	31	--	--	--	--	--	--	6	--	25	--	--
Black walnut	274	--	--	5	3	19	--	30	--	73	144	--
Other hardwoods	709	--	3	11	4	178	7	167	--	46	293	--
Total hardwoods	11,888	6	180	439	1,162	940	3,159	1,548	39	1,786	2,629	--
All species	15,780	2,306	869	743	1,284	1,077	3,143	1,590	39	1,804	2,881	44

Table 46. -- Current annual net growth of sawtimber on timberland by species group and forest type, Nebraska, 1993

(In thousand board feet) ¹

Species group	Forest type											
	All types	Ponderosa pine	Eastern redcedar	Eastern redcedar-hardwood	Bur oak	Oak-hickory	Cottonwood	Elm-ash-cottonwood	Willow	Maple-basswood	Elm-ash-locust	Non-stocked
Softwoods												
Ponderosa pine	13,102	11,705	179	153	484	238	--	--	--	--	183	160
Eastern redcedar	5,416	20	2,099	689	587	--	50	111	--	78	1,782	--
Total softwoods	18,518	11,725	2,278	842	1,071	238	50	111	--	78	1,965	160
Hardwoods												
Select white oak	10,761	13	62	940	4,832	2,217	--	42	--	1,535	1,120	--
Select red oak	1,854	--	--	20	295	1,430	--	--	--	48	61	--
Other red oak	202	--	--	--	16	186	--	--	--	--	--	--
Select hickory	38	--	--	--	--	23	--	--	--	--	15	--
Other hickory	122	--	--	--	--	96	--	--	--	26	--	--
Basswood	4,245	--	--	155	161	226	--	211	--	3,344	148	--
Silver maple	3,083	--	--	--	--	--	125	2,322	--	--	636	--
Elm	2,248	--	8	-8	98	622	-90	354	--	-109	1,373	--
White & green ash	4,614	--	96	13	223	56	213	1,624	--	76	2,313	--
Cottonwood	23,349	--	128	1,280	--	205	19,174	1,853	67	126	516	--
Willow	2,736	--	77	--	--	22	634	714	142	34	1,113	--
Hackberry	7,645	--	50	55	109	493	--	2,477	--	3,181	1,280	--
Black walnut	1,320	--	--	3	130	53	--	20	--	626	488	--
Other hardwoods	2,274	--	--	197	44	300	--	703	--	153	877	--
Total hardwoods	64,491	13	421	2,655	5,908	5,929	20,056	10,320	209	9,040	9,940	--
All species	83,009	11,738	2,699	3,497	6,979	6,167	20,106	10,431	209	9,118	11,905	160

¹ International 1/4-inch rule.

Table 47. -- Current annual net growth, current annual mortality, and current annual removals, of growing stock and sawtimber on timberland by species group, Nebraska, 1993

Species group	Growing stock			Sawtimber		
	Current annual net growth ¹	Current annual mortality	Current annual removals ²	Current annual net growth ¹	Current annual mortality	Current annual removals ²
	1993	1993	1993	1993	1993	1993
	<i>(In thousand cubic feet)</i>			<i>(In thousand board feet) ³</i>		
Softwoods						
Ponderosa pine	2,525	923	5,295	13,102	3,985	26,822
Eastern redcedar	1,357	481	313	5,416	1,577	1,443
Other softwoods	10	--	1	--	--	4
Total softwoods	3,892	1,404	5,609	18,518	5,562	28,269
Hardwoods						
Select white oak	1,803	709	325	10,761	3,013	1,292
Other white oak	--	--	1	--	--	3
Select red oak	298	152	42	1,854	666	151
Other red oak	67	55	5	202	93	18
Select hickory	22	27	--	38	45	--
Other hickory	52	51	--	122	113	--
Basswood	485	363	19	4,245	1,069	111
Soft maple	383	228	34	3,083	1,018	24
Elm	615	2,359	123	2,248	8,435	395
White & green ash	1,459	742	119	4,614	2,452	454
Cottonwood	3,568	6,537	5,566	23,349	31,295	31,987
Willow	476	313	60	2,736	1,290	6
Hackberry	1,646	454	372	7,645	1,598	788
Black cherry	31	8	--	--	--	--
Black walnut	274	131	114	1,320	277	560
Other hardwoods	709	424	67	2,274	1,002	314
Total hardwoods	11,888	12,553	6,847	64,491	52,366	36,103
All species	15,780	13,957	12,456	83,009	57,928	64,372

¹ An estimate of current gross growth may be computed by adding current mortality to current net growth.

² Based on data from a 1993 mill survey, regional logging utilization factors, and land-use change estimates from the new inventory.

³ International 1/4-inch rule.

Table 48. -- Current annual removals for 1983 and 1993, and average annual removals for 1983-1993 from growing stock and sawtimber on timberland by softwoods and hardwoods and Forest Survey Unit, Nebraska

Forest Survey Unit by softwoods and hardwoods	Growing stock			Sawtimber		
	Current annual removals	Average annual removals	Current annual removals	Current annual removals	Average annual removals	Current annual removals
	1983 ¹	1983-1993 ²	1993 ¹	1983 ¹	1983-1993 ²	1993 ¹
	<i>(In thousand cubic feet)</i>			<i>(In thousand board feet) ³</i>		
Eastern Unit						
Softwoods	34	170	163	139	213	835
Hardwoods	7,420	3,164	5,837	29,427	14,668	30,895
Total	7,454	3,334	6,000	29,566	14,881	31,730
Western Unit						
Softwoods	539	2,844	5,446	2,407	13,504	27,434
Hardwoods	1,357	410	1,010	4,291	1,082	5,208
Total	1,896	3,254	6,456	6,698	14,586	32,642
All Units						
Softwoods	573	3,014	5,609	2,546	13,717	28,269
Hardwoods	8,777	3,574	6,847	33,718	15,750	36,103
Total	9,350	6,588	12,456	36,264	29,467	64,372

¹ Based on data from mill surveys and regional logging utilization studies and land-use change estimates from the field inventory.

² Average of field plot level removals between the study periods.

³ International 1/4-inch rule.

Table 49. -- Current annual mortality for 1983 and 1993, and average annual mortality for 1983-1993 of growing stock and sawtimber on timberland by softwoods and hardwoods, and Forest Survey Unit, Nebraska

Forest Survey Unit by softwoods and hardwoods	Growing stock			Sawtimber		
	Current annual mortality	Average annual mortality	Current annual mortality	Current annual mortality	Average annual mortality	Current annual mortality
	1983	1983-1993	1993	1983	1983-1993	1993
	<i>(In thousand cubic feet)</i>			<i>(In thousand board feet) ¹</i>		
Eastern Unit						
Softwoods	139	205	280	319	534	988
Hardwoods	5,623	9,311	9,637	20,677	30,423	39,467
Total	5,762	9,516	9,917	20,996	30,957	40,455
Western Unit						
Softwoods	1,089	1,271	1,124	4,020	3,640	4,574
Hardwoods	1,757	2,514	2,916	5,624	8,766	12,899
Total	2,846	3,785	4,040	9,644	12,406	17,473
All Units						
Softwoods	1,228	1,476	1,404	4,339	4,174	5,562
Hardwoods	7,380	11,825	12,553	26,301	39,189	52,366
Total	8,608	13,301	13,957	30,640	43,363	57,928

¹ International 1/4-inch rule.

Table 50. -- Current annual timber removals of growing stock and sawtimber on timberland by species group, product, logging residue, and other removals, Nebraska, 1993

Species group	Growing stock								Sawtimber								
	Removals for products (items)							Nonproduct residue	Other removals	Removals for products (items)						Nonproduct residue	Other removals
	All removals	All product removals	Saw logs	Veneer logs	Fuel- wood	Misc. products	All removals			All product removals	Saw logs	Veneer logs	Fuel- wood	Misc. products			
(In thousand cubic feet)									(In thousand board feet) ¹								
Softwoods																	
Ponderosa pine	5,295	3,766	3,766	--	--	--	404	1,125	26,822	21,678	21,678	--	--	--	573	4,571	
Eastern redcedar	313	224	105	--	--	119	11	78	1,443	1,123	476	--	--	647	44	276	
Other softwoods	1	1	--	--	1	--	--	--	4	4	1	--	3	--	--	--	
Total softwoods	5,609	3,991	3,871	--	1	119	415	1,203	28,269	22,805	22,155	--	3	647	617	4,847	
Hardwoods																	
Select white oak	325	207	150	24	33	--	48	70	1,292	866	686	105	75	--	63	363	
Other white oak	--	--	--	--	--	--	--	--	3	3	2	1	--	--	--	--	
Select red oak	42	35	21	7	7	--	7	--	151	142	95	31	16	--	9	--	
Other red oak	5	4	1	3	--	--	1	--	17	17	5	12	--	--	--	--	
Select hickory	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Other hickory	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Basswood	19	17	17	--	--	--	2	--	111	108	107	1	--	--	3	--	
Soft maple	34	4	4	--	--	--	--	30	24	23	23	--	--	--	1	--	
Elm	123	92	40	--	52	--	4	27	395	387	251	--	136	--	8	--	
White & green ash	119	64	37	--	27	--	15	40	454	290	215	--	75	--	33	131	
Cottonwood	5,566	4,494	4,272	92	55	75	659	413	31,987	28,647	27,687	398	153	409	1,348	1,992	
Willow	60	1	1	--	--	--	--	59	6	6	6	--	--	--	--	--	
Hackberry	372	14	14	--	--	--	2	356	788	87	86	--	1	--	3	698	
Black walnut	115	81	72	9	--	--	7	27	560	531	467	64	--	--	29	--	
Other hardwoods	67	4	4	--	--	--	1	62	314	30	29	1	--	--	1	283	
Total hardwoods	6,847	5,017	4,633	135	174	75	746	1,084	36,102	31,137	29,659	613	456	409	1,498	3,467	
All species	12,456	9,008	8,504	135	175	194	1,161	2,287	64,371	53,942	51,814	613	459	1,056	2,115	8,314	

¹ International 1/4-inch rule.

Table 51. -- Total volume of wood fiber used for each primary product by softwoods and hardwoods, and source of material, Nebraska, 1993

Product by softwoods and hardwoods		Standard units	Roundwood products						Plant byproducts ¹	
			Total		Growing stock		Non-growing stock			
			Number of units	Thousand cubic feet ²	Number of units	Thousand cubic feet	Number of units	Thousand cubic feet	Number of units	Thousand cubic feet
Saw logs										
Softwoods	Thousand	22,202	3,876	22,174	3,871	28	5	--	--	
Hardwoods	board feet ²	30,515	4,750	29,856	4,633	659	117	--	--	
Total		52,717	8,626	52,030	8,504	687	122	--	--	
Veneer logs										
Hardwoods	Thousand	623	136	614	135	9	1	--	--	
Total		623	136	614	135	9	1	--	--	
Fuelwood										
Softwoods	Standard	14,245	997	13	1	6,432	450	7,800	546	
Hardwoods	cords	166,988	11,759	2,490	174	163,901	11,543	597	42	
Total		181,233	12,756	2,503	175	171,333	11,993	8,397	588	
Posts, poles and pilings										
Softwoods	Thousand	122	122	--	--	122	122	--	--	
Hardwoods	cubic feet	44	44	--	--	44	44	--	--	
Total		166	166	--	--	166	166	--	--	
Miscellaneous products										
Softwoods	Thousand	174	174	119	119	--	--	55	55	
Hardwoods	cubic feet	3,243	3,243	75	75	--	--	3,168	3,168	
Total		3,417	3,417	194	194	--	--	3,223	3,223	
All products										
Softwoods	Thousand				3,991		577		601	
Hardwoods	cubic feet				5,017		11,705		3,210	
Total					9,008		12,282		3,811	

¹ Includes coarse and fine wood residues.² Column should not be added to avoid double counting volume.³ International 1/4-inch rule.

Table 52. -- Output of roundwood products by product, softwoods and hardwoods,
and source of material, Nebraska, 1993

(In thousand cubic feet)

Product by softwoods and hardwoods	All sources	Growing stock			Non-growing stock
		Total	Sawtimber	Poletimber	
Saw logs					
Softwoods	3,876	3,871	3,871	--	5
Hardwoods	4,750	4,633	4,624	9	117
Total	8,626	8,504	8,495	9	122
Veneer logs					
Hardwoods	136	135	135	--	1
Total	136	135	135	--	1
Fuelwood					
Softwoods	451	1	1	--	450
Hardwoods	11,717	174	99	75	11,543
Total	12,168	175	100	75	11,993
Posts, poles, and pilings					
Softwoods	122	--	--	--	122
Hardwoods	44	--	--	--	44
Total	166	--	--	--	166
Miscellaneous products					
Softwoods	119	119	108	11	--
Hardwoods	75	75	68	7	--
Total	194	194	176	18	--
All products					
Softwoods	4,568	3,991	3,980	11	577
Hardwoods	16,722	5,017	4,926	91	11,705
Total	21,290	9,008	8,906	102	12,282

Table 53. -- Timber products from roundwood by species group and product, Nebraska, 1993

Species group	All products	Saw logs		Veneer logs		Fuelwood		Posts, poles, and pilings	Misc. products
	<i>Thousand cubic feet</i>	<i>Thousand board feet ¹</i>	<i>Thousand cubic feet</i>	<i>Thousand board feet ¹</i>	<i>Thousand cubic feet</i>	<i>Standard cords</i>	<i>Thousand cubic feet</i>	<i>Thousand cubic feet</i>	<i>Thousand cubic feet</i>
Softwoods									
Ponderosa pine	3,787	21,704	3,770	--	--	238	17	--	--
Eastern redcedar	653	497	106	--	--	4,376	306	122	119
Other softwoods	128	1	--	--	--	1,831	128	--	--
Total softwoods	4,568	22,202	3,876	--	--	6,445	451	122	119
Hardwoods									
Select white oak	1,478	1,257	224	105	24	17,565	1,230	--	--
Other white oak	1	4	1	1	--	--	--	--	--
Select red oak	299	174	31	31	7	3,729	261	--	--
Other red oak	5	10	2	12	3	--	--	--	--
Select hickory	107	--	--	--	--	1,523	107	--	--
Other hickory	55	--	--	--	--	788	55	--	--
Basswood	20	124	20	1	--	--	--	--	--
Soft maple	36	27	4	--	--	460	32	--	--
Elm	3,919	291	46	--	--	55,324	3,873	--	--
White & green ash	2,468	235	41	--	--	34,678	2,427	--	--
Cottonwood	7,167	27,687	4,272	398	91	38,981	2,729	--	75
Willow	1	7	1	--	--	--	--	--	--
Hackberry	26	99	16	--	--	148	10	--	--
Black walnut	213	563	86	73	10	1,665	117	--	--
Other hardwoods	345	33	5	1	--	4,854	340	--	--
Total hardwoods	16,140	30,511	4,749	622	135	159,715	11,181	--	75
Noncommercial Spp.	582	4	1	--	--	7,677	537	44	--
All species	21,290	52,717	8,626	622	135	173,837	12,169	166	194

¹ International 1/4-inch rule.

Table 54. -- All live tree biomass on timberland by species group and forest type, Nebraska, 1994

(In green tons)

		Forest type										
	All types	Ponderosa pine	Eastern redcedar	Eastern redcedar-hardwood	Bur oak	Oak-hickory	Cottonwood	Elm-ash-cottonwood	Willow	Maple-basswood	Elm-ash-locust	Non-stocked
Softwoods												
Ponderosa pine	6,257,884	5,646,655	135,706	89,128	125,292	134,910	--	--	--	--	72,511	53,682
Eastern redcedar	2,188,683	81,132	831,954	697,346	136,053	39,678	124,645	43,450	--	64,420	170,005	--
Other softwoods	36,883	12,603	--	--	--	--	--	--	--	--	24,280	--
Total softwoods	8,483,450	5,740,390	967,660	786,474	261,345	174,588	124,645	43,450	--	64,420	266,796	53,682
Hardwoods												
Select white oak	10,304,706	85,948	315,677	729,150	4,971,748	1,225,529	--	112,088	--	1,371,829	1,492,737	--
Select red oak	824,513	--	--	75,591	73,418	508,747	--	--	--	132,044	34,713	--
Other red oak	174,538	--	--	7,703	69,498	97,337	--	--	--	--	--	--
Select hickory	123,433	--	--	--	--	100,768	--	--	--	4,959	17,706	--
Other hickory	242,752	--	--	--	4,731	169,834	--	--	--	55,780	12,407	--
Basswood	1,499,586	--	--	77,401	33,880	133,911	--	32,862	--	1,124,402	97,130	--
Silver maple	1,031,497	--	--	--	34,236	--	74,169	532,052	--	--	391,040	--
Elm	4,727,310	128	53,560	159,796	236,204	126,378	279,520	752,112	--	372,443	2,747,169	--
White & green ash	4,794,085	6,492	147,821	205,708	269,851	51,311	258,583	1,343,112	--	469,542	2,041,665	--
Cottonwood	14,714,032	--	106,108	1,061,579	--	78,796	9,978,277	1,968,869	15,103	348,742	1,156,558	--
Willow	990,356	--	66,051	18,825	--	6,100	186,809	358,751	61,949	17,723	274,148	--
Hackberry	2,687,013	--	71,795	37,970	88,332	185,468	315	477,700	--	1,180,304	645,129	--
Black cherry	65,278	--	--	--	--	--	--	8,119	--	14,975	42,184	--
Black walnut	938,821	--	--	21,823	36,925	62,910	7,060	79,320	--	364,772	366,011	--
Other hardwoods	4,382,791	78,496	69,187	497,759	88,357	150,652	110,158	1,460,656	--	336,657	1,590,869	--
Total hardwoods	47,500,711	171,064	830,199	2,893,305	5,907,180	2,897,741	10,894,891	7,125,641	77,052	5,794,172	10,909,466	--
Noncommercial spp.	706,791	1,201	--	26,464	130,226	41,440	7,747	87,410	--	337,861	74,442	--
All species	56,690,952	5,912,655	1,797,859	3,706,243	6,298,751	3,113,769	11,027,283	7,256,501	77,052	6,196,453	11,250,704	53,682

Table 55. -- All live tree biomass on timberland by species group and tree biomass component (in green tons), Nebraska, 1994

(In green tons)

Species group	All components	All live 1-5-inch trees	Biomass component					
			Growing-stock trees			Non-growing-stock trees		
			Stumps	Boles	Tops and limbs	Stumps	Boles	Tops and limbs
Softwoods								
Ponderosa pine	6,257,884	183,757	333,138	4,290,516	467,175	77,125	811,763	94,410
Eastern redcedar	2,188,683	420,544	123,903	1,016,723	310,325	26,664	223,752	66,772
Other softwoods	36,883	7,411	665	3,297	1,230	1,870	17,565	4,845
Total softwoods	8,483,450	611,712	457,706	5,310,536	778,730	105,659	1,053,080	166,027
Hardwoods								
Select white oak	10,304,706	226,654	315,573	3,613,332	1,013,538	343,364	3,711,485	1,080,760
Select red oak	824,513	18,251	39,005	501,519	143,398	6,236	93,335	22,769
Other red oak	174,538	--	9,435	92,108	31,806	2,343	30,580	8,266
Select hickory	123,433	10,736	6,491	65,964	22,255	1,062	12,821	4,104
Other hickory	242,752	12,918	10,679	115,215	39,274	3,793	46,145	14,728
Basswood	1,499,586	107,390	55,291	663,408	197,516	26,115	353,538	96,328
Silver maple	1,031,497	9,300	23,702	371,300	100,571	24,995	394,591	107,038
Elm	4,727,310	646,290	145,852	1,174,045	405,743	186,776	1,635,080	533,524
White & green ash	4,794,085	276,514	139,960	1,732,766	524,719	124,371	1,532,752	463,003
Cottonwood	14,714,032	103,619	654,295	9,167,827	2,183,766	139,667	2,002,609	462,249
Willow	990,356	28,257	35,424	391,730	112,347	27,895	308,761	85,942
Hackberry	2,687,013	245,101	109,446	1,025,351	312,928	69,221	720,795	204,171
Black cherry	65,278	2,738	1,519	14,064	4,910	2,922	29,104	10,021
Black walnut	938,821	23,468	38,728	431,628	132,612	18,979	227,555	65,851
Other hardwoods	4,382,791	333,986	48,069	534,574	164,878	207,287	2,381,991	712,006
Total hardwoods	47,500,711	2,045,222	1,633,469	19,894,831	5,390,261	1,185,026	13,481,142	3,870,760
Noncommercial spp.	706,791	229,635	--	--	--	36,273	326,363	114,520
All species	56,690,952	2,886,569	2,091,175	25,205,367	6,168,991	1,326,958	14,860,585	4,151,307

Table 56. -- Sampling errors for Forest Survey Units and Natural Resources Districts for area of timberland, volume, average annual net growth, and average annual removals on timberland, Nebraska, 1994

(Sampling error in percent)

Forest Survey Unit	Area	Growing stock			Sawtimber		
		Volume	Average annual net growth	Average annual removals	Volume	Average annual net growth	Average annual removals
Eastern Unit	6.3	8.1	11.8	32.6	9.7	13.8	28.8
Western Unit	7.5	9.3	13.5	37.4	10.7	15.2	31.7
Total	4.8	6.1	8.9	24.7	7.2	10.2	21.4
Natural Resources Districts							
Upper Niobrara-White	11.9	15.2	24.9	40.4	17.3	30.5	37.0
Middle Niobrara	23.6	29.3	59.5	>100.0	33.6	66.9	>100.0
Lower Niobrara	17.8	20.4	39.9	>100.0	23.0	44.2	91.4
North, South, and Twin Platte/Upper Loup	20.3	29.9	34.5	83.9	34.2	50.2	82.2
Lower Loup	16.5	27.5	38.9	>100.0	34.6	62.0	--
Upper, Middle, and Lower Republican	24.0	26.9	32.4	>100.0	32.7	33.0	>100.0
Central Platte/Tri Basin	20.7	23.9	32.2	97.0	27.9	35.8	81.8
Upper and Lower Elkhorn	20.3	23.9	40.0	>100.0	27.2	42.4	>100.0
Lewis and Clark	18.4	23.3	30.1	>100.0	28.8	32.6	70.2
Papio-Missouri River	14.1	17.8	22.8	79.5	22.0	24.8	53.8
Lower Platte North/Upper Big Blue	25.0	30.0	43.8	>100.0	34.7	48.4	>100.0
Lower Platte South	22.1	29.1	42.6	>100.0	34.5	51.5	>100.0
Little Blue	26.2	30.3	41.0	>100.0	35.4	45.8	>100.0
Lower Big Blue	24.3	32.0	46.4	>100.0	37.8	56.0	>100.0
Nemaha	16.7	21.8	32.4	>100.0	26.1	39.4	>100.0

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The third inventory of Nebraska's forests reports 49.2 million acres of land, of which 947.7 thousand acres are forested. This bulletin contains detailed tables related to the extent, composition, and causes of change of Nebraska's forests.

KEY WORDS: Forest area, timber volume, growth, removals, mortality.



Our job at the North Central Forest Experiment Station is discovering and creating new knowledge and technology in the field of natural resources and conveying this information to the people who can use it. As a new generation of forests emerges in our region, managers are confronted with two unique challenges: (1) Dealing with the great diversity in composition, quality, and ownership of the forests, and (2) Reconciling the conflicting demands of the people who use them. Helping the forest manager meet these challenges while protecting the environment is what research at North Central is all about.

